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AVIATION SAFETY LETTER

In this Issue...

Occurrence Reports: Where Do They Come From and How Are They Used?

COPA Corner: Distractions Affect All of Us

An Ounce of Prevention...Corrective Action Plans

Major Accident Report: Bell 206 Down in Cranbrook, B.C.

What Went Wrong: In-Flight Blackout

Assumptions

Smoke in the Cabin—Landing Light Switch Failure

Oral Counselling

Déja vu: The Importance of the Underwater-Egress Pre-Flight Briefing for Passengers

Learn from the mistakes of others;
you'll not live long enough to make them all yourself ...

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Table of Contents

section	page
Pre-Flight	3
Flight Operations	9
Maintenance and Certification	17
Recently Released TSB Reports	21
Accident Synopses	31
Regulations and You	34
Debrief: Déja vu: The Importance of the Underwater-Egress Pre-Flight Briefing for Passengers	36
Self-Paced Study Program	Tear-off

PRE-FLIGHT

A Word of Warning to All Operators Regarding Dangerous Goods ..... page 3
Occurrence Reports: Where Do They Come From and How Are They Used? ..... page 4
COPA Corner: Distractions Affect All of Us ..... page 6
An Ounce of Prevention...Corrective Action Plans ..... page 7

A Word of Warning to All Operators Regarding Dangerous Goods

by Micheline Paquette, Acting Program Manager, Dangerous Goods, Standards, Civil Aviation, Transport Canada

Transport Canada has identified a potential hazard associated with the carriage of undeclared dangerous goods on Canadian aircraft.

Undeclared dangerous goods take many forms, the classic example being the chemical oxygen generators carried on board in the crash of ValueJet Airlines Flight 592 on May 11, 1996. The U.S. National Transportation Safety Board (NTSB) aircraft accident report of Flight 592 identified the root cause as being a series of decisions that lead to the inadvertent loading of the chemical oxygen generators in the cargo hold. A fire ensued, engulfing combustible materials nearby, and was proliferated by the generation of oxygen gas. The aircraft crashed in the Florida Everglades and everyone on board perished. Measures had not been in place or communicated to ensure that air operator personnel—including third party personnel—were capable of recognizing dangerous goods.

Undeclared dangerous goods are found daily in passenger baggage, company materials, cargo, stores and airmail. A small percentage is reported; however, Transport Canada suspects that a considerable number of items entering the aviation transportation system are not detected for various reasons. To mitigate this hazard, and for the safety of their staff as well as their operations, air operators must ensure that company personnel know how to recognize dangerous goods and the indicators that dangerous goods are being presented for transport.

Are you a dangerous-goods operator?
The *Transportation of Dangerous Goods Act, 1992* (TDG Act) and the *Transportation of Dangerous Goods Regulations* (TDG Regulations) apply to you if you handle, offer for transport, import, or transport dangerous goods to, from, or within Canada. The Act and Regulations also apply to aircraft that are registered in Canada but are operated outside Canada. This includes the transportation of replacement parts (i.e. spares) such as fire extinguishers, oxygen cylinders, engines, fuel pumps, fuel control units, first aid kits, life vests, etc. Activities carried out under a regulatory exemption are also subject to the TDG Regulations. Regulatory exemptions allow passengers to bring on board the aircraft articles such as aerosols, toiletry articles, cellular phones, portable computers, cigarette lighters, etc. The exemptions also permit operators to stow electric wheelchairs in the cargo hold and to carry dangerous goods such as aerosols, alcoholic beverages and perfumes for use or sale on board the aircraft during the flight. If any of these regulatory exemptions apply to your operation, you are in fact handling, offering for transport, or transporting dangerous goods.

Training is the key to understanding and complying with the TDG Regulations. This enables a person to determine whether a product is considered to be dangerous goods, whether the dangerous goods are regulated, and how to use the TDG Regulations efficiently.

International implications for Canadian non-dangerous-goods operators
Air operators who state in their operations manual that they will not conduct dangerous-goods activities and choose not to provide awareness training to their employees may encounter some delays and/or difficulties when operating outside Canada.

The International Civil Aviation Organization's (ICAO) Annex 6 to the *Convention on International Civil Aviation* contains standards and recommended practices (SARP), which are applicable to member States, to regulate the aviation industry. The ICAO SARPs require that the ground and flight crew member training program include a section on the transport of dangerous goods. In the United States, the Department of Transport has already developed regulations in the *Code of Federal Regulations*, Title 14 to require awareness training for "will-not-carry" certificate holders. Other ICAO member States have also included such requirements.

It should be noted that Canada has not yet incorporated the ICAO SARPs into the *Canadian Aviation Regulations* (CARs); however, this does not relieve Canadian operators from complying with foreign regulations when travelling within their jurisdictions. Foreign authorities check foreign carriers more frequently, and failing to meet ICAO or foreign requirements may be problematic—even if the Canadian operator meets the domestic regulations.

Safety management systems
A safety management system (SMS) is an explicit, comprehensive and proactive process for managing risks. Since dangerous goods entering the transportation system present a variety of risks to aviation safety, it is important that all air operators establish a comprehensive and proactive process for dealing with dangerous goods in their own contexts. Under the principals of SMS, operators must ensure that their system as a whole promotes safe operations.

The general conditions of an air operator certificate stipulate that the holder must conduct flight operations safely and in accordance with the company operations manual. Part of those general conditions is Transport Canada's approval of procedures for the carriage of dangerous goods in the company operations manual and the dangerous goods training program.

Transport Canada's position
It is likely that most air operators are involved in the transport of dangerous goods in some respect. The great majority of air operators do take advantage of the regulatory exemptions to transport dangerous goods carried by passengers and to transport replacement parts. Thus, they are subject to the regulations, and Transport Canada requires, at a minimum, awareness training for all personnel involved in the processing of passengers, cargo, mail and stores; this includes third party personnel and instructions to be provided to employees in the company operations manual. This training and information assist employees in the recognition of dangerous goods and in understanding their responsibilities in preventing non-compliant or undeclared dangerous goods from entering the aviation transportation system and compromising the safety of the Canadian travelling public.

Air operators wanting to obtain more information should contact their Transport Canada Civil Aviation regional office. △

Occurrence Reports: Where Do They Come From and How Are They Used?

by Ann Lindeis, Manager, Safety Management Planning and Analysis, NAV CANADA

Introduction
In Canada, operating certificate and licence holders have obligations when it comes to reporting aviation occurrences. These obligations are set out in various acts and regulations. However, many in the aviation industry are likely unaware of how aviation occurrence reports (AOR) are generated and disseminated. There are also many misconceptions about how the information contained in occurrence reports is used.

Transparency in how safety information will be employed is an essential element to creating an effective safety culture. The purpose of this article, therefore, is to provide an overview of the occurrence reporting process in Canada from the perspectives of NAV CANADA, Transport Canada (TC), and the Transportation Safety Board of Canada (TSB).

NAV CANADA
NAV CANADA has a mandatory reporting system through which operational employees report specific types of occurrences. Such AORs are entered into NAV CANADA's occurrence database.

The key information submitted is automatically distributed via e-mail to TC's Civil Aviation Contingency Operations Division (CACO) and to the appropriate TSB regional office.

In addition, a summary of the previous day's entries in the database is distributed every morning to an internal and external mailing list. Personal information, such as the names of individuals involved, is not included in the AORs.

NAV CANADA reviews all AORs submitted and identifies those considered to be operating irregularities (OI), which are defined as situations where: air traffic services (ATS) are being provided and a preliminary investigation indicates that safety may have been jeopardized, less than minimum separation may have existed, or both.

Any OI where the provision of ATS is thought to have contributed to the outcome is investigated through NAV CANADA's operations safety investigation (OSI) process. The results of the investigation are used to identify potential mitigations to prevent recurrence.

In addition, NAV CANADA frequently exchanges information and follows up with individual operators after an aviation occurrence. Safety-specific inquiries may be directed to NAV CANADA through the following e-mail address: operationalsafety@navcanada.ca.

Transport Canada
TC uses the Civil Aviation Daily Occurrence Reporting System (CADORS) to collect information on occurrences in the National Civil Air Transportation System (NCATS). *Canadian Aviation Regulation* (CAR) 807.01 prescribes the requirement to report, as follows:

> *The holder of an ATS operations certificate shall report to the Minister any aviation occurrence information specified in the* CADORS Manual *in accordance with the criteria and reporting procedures specified in that manual.*

Annex A of the *CADORS Manual* lists the types of occurrences that must be reported. Examples include collisions or risks of collision; declared emergencies; regulatory infractions; or any occurrence that deviates from normal operating procedures, may generate a high degree of public interest or concern, or could be of direct interest to specific foreign aviation authorities. The *CADORS Manual* is currently in the process of being updated.

Since the year 2000, almost 95 percent of the CADORS information has consisted of reports filed in accordance with the criteria for mandatory reporting. Other reports have been obtained from sources such as the U.S. Federal Aviation Administration (FAA), the TSB, airports, operators and private individuals.

NAV CANADA sends AOR information to CACO, who then forwards it to one of TC's five regional offices, as appropriate. The information is then entered into the CADORS.

Efforts are taken to ensure quality, but because the information found in the CADORS is preliminary and subject to change, it is not always possible to guarantee the accuracy of the information.

In the interest of improving aviation safety, CADORS reports are available on TC's Web site, at www.tc.gc.ca/cadors.

Identifiable information, such as the aircraft's registration number, is removed and licence-holder information, e.g. pilot or controller names, is not entered in the CADORS. It is possible to search occurrence data from 1993 on using criteria such as date, aircraft make and model, or information included in the narrative.

CADORS data is monitored and analyzed by Civil Aviation employees to assist in the identification of hazards and trends. It provides inspectors with information related to operators under TC oversight.

Inquiries regarding the CADORS may be sent to TC through the following e-mail address: cadors-screaq@tc.gc.ca.

Transportation Safety Board of Canada
Owners, operators, crew members and air traffic controllers have an obligation to report accidents and reportable aviation incidents to the TSB as soon as possible and by the quickest means available.

Approximately 2 000 aviation-related transportation occurrences are reported to the TSB each year. Any of these occurrences may be investigated if they are deemed to meet criteria based on risk, safety benefit and public expectations.

If the occurrence is not investigated, the information provided will be stored in the TSB's database for statistical analysis. The database also allows the TSB to conduct trend analyses and determine if a safety issues investigation may be the appropriate vehicle to highlight a recurring problem.

If the occurrence is investigated, the TSB makes available factual information about the circumstances of the occurrence throughout the investigation. Safety information is shared immediately with those who can make changes to improve safety, and may take the form of recommendations, safety advisories or safety information letters.

However, for some types of information—including on-board recordings, representations to the Board, and personal information such as witness statements—there are stringent restrictions on who may access the information and how it may be used.

Conclusion
Information collected with respect to aviation occurrences is shared throughout the aviation community and used by operators, NAV CANADA, TC and the TSB to identify hazards and to improve safety.

The collection and use of occurrence data provides significant safety benefit to the aviation community. We trust that this article has helped to clarify how this information is collected and used, and to make clear that personal information is not included in any of this data.

This article was prepared by NAV CANADA, but was a collaborative effort between NAV CANADA, TC and the TSB. —Ed. △

COPA Corner: Distractions Affect All of Us

by Dale Nielsen. This article was originally published in the "Chock to Chock" column of the February 2009 issue of COPA Flight, and is reprinted with permission.

Distractions are the number one cause of forgetting things.

There are two main reasons for this. The first is we are always thinking ahead of what we are doing. Therefore, when we are distracted, we tend to think we were further along in our task than we actually were.

The second is our short-term memory is very short so any distraction may cause us to lose what we were thinking of when distracted.

A pilot arrived at a maintenance hangar to pick up his C-172, which should have been ready after a 100-hour inspection. It was late afternoon and he had a flight of about 100 miles back to his home airport before grounding.

The aircraft was not ready. The chief mechanic was working on the aircraft himself in an attempt to get it out of the hangar. Shortly before the mechanic was to replace the engine cowlings, he was called to the phone. He glanced at the waiting pilot and called to another mechanic to finish up and cowl the aircraft.

The second mechanic looked the engine compartment over and everything appeared to be where it was supposed to be so he replaced the engine cowlings. The chief mechanic returned and saw the cowlings had been replaced, so he signed out the logbooks and sent the pilot on his way. The flight to the pilot's home base was uneventful, but the next day he tried to start the aircraft and it would not start. He removed the engine cowlings and noted that three of the four sparkplug wires had become unattached from the sparkplugs.

The distraction of the telephone, coupled with the pressure to get the aircraft inspection completed, resulted in the chief mechanic not giving a full hand-over briefing to the second mechanic. He was thinking ahead to replacing the cowlings and that is what he mentioned. The second mechanic saw that the sparkplug wires were connected, but did not check to see if they were tightened.

Fortunately, the sparkplug wires did not all come loose in flight.

A rental pilot was performing a pre-flight inspection on a C-172 when the three friends he was taking on a sightseeing flight arrived at the airfield fence. The young pilot stopped what he was doing and let his friends in through the FBO [fixed-base operator]. He then completed his inspection, loaded his passengers and began taxiing the aircraft.

The FBO owner saw the aircraft taxiing with the tow bar still attached to the nose wheel and called the FSS [flight service station] specialist to request that the aircraft be stopped and shut down so the tow bar could be removed.

The phone is one of the most common distractions, and most calls can wait.

A commercial pilot was interrupted during his pre-flight inspection to answer a phone call from IFR Flight Data regarding his flight plan. After the call, he continued with the inspection. After starting the engines he noted the engine temperature in the right engine was climbing into the red. He shut down the engine and went to take a look. He had forgotten to remove the engine intake covers from the right engine.

Both pilots returned to where they thought they were in the inspection process. We usually think about three steps ahead of where we are during any task, so it is easy to forget steps when distracted. A good rule to follow whenever we are distracted or interrupted is to go back at least three steps from where we thought we were when distracted. If unsure, start over.

The length of our short-term memories compounds this. Our short-term memory is only about 30 seconds. We must do something specific to transfer information from short- to long-term memory. We normally do this subconsciously, but it does take some concentration.

The other problem with short-term memory is that it has a limited capacity of six to seven unrelated items. Maybe that is a good thing. When we get distracted, there are a limited number of things we can forget.

Fatigue and stress directly affect our ability to transfer information to long-term memory and to access information in our long-term memory. Therefore, when we are tired or stressed, we increase our chances significantly of forgetting to do things we intend to do. We are all tired or stressed at times. When we are, we must avoid distractions and multi-tasking. Multi-tasking is actually self-distraction. We are not as capable of multi-tasking as we think we are. This is why some provinces are banning cell phone use while driving.

The number one distraction for all of us is the phone/cell phone. There are times when the phone should not be answered and probably should be turned off. The vast majority of the calls we receive could be missed without the world ending. Most of the remaining calls can go to voicemail and be returned at a more convenient time.

The next most common distraction is people directly wanting our attention. This includes friends, significant others, co-workers and bosses. When we wish to talk to someone, we seldom, if ever, observe what they are doing before we interrupt them. We are a social society and most of us do not mind being talked to.

There are times, though, when we do not wish to be disturbed and times when we should not be disturbed. Be courteous and take the time to observe those you wish to talk to, to determine if now is a good time to do so. If we are not sure, we can ask if the individual has a moment. This will give them the opportunity to complete a task or to at least put themselves in a position to transfer information to long-term memory and be prepared to pay full attention to us.

Distractions affect all of us. The best we can do is to minimize them. Mistakes caused by distractions are, at least, embarrassing and, at worst, damaging.

Dale Nielsen is an ex-Armed Forces pilot and aerial photography pilot. He lives in Abbotsford, B.C., and currently flies air charters. He still freelances as a flying instructor and seminar facilitator. Nielsen is also the author of seven flight training manuals published by Canuck West Holdings. Dale can be contacted via e-mail: dale@flighttrainingmanuals.com. △

An Ounce of Prevention...Corrective Action Plans

by Cliff Marshall, Technical Program Manager, Technical Program Evaluation and Co-ordination, Standards, Civil Aviation, Transport Canada

Taking effective corrective action is an essential part of a solid management system and central to a closed-loop, continuous improvement process.

Corrective action plans (CAP) are generally formal responses to findings and are intended to map out corrective measures. These findings can be generated from several sources, such as a certificate holder's internal quality assurance system; investigations arising from a company's safety reports; or a regulator's inspections and assessments. In all cases, the findings identify a situation where a company policy, procedure, or process does not conform to either the organization's internal policies or to regulatory requirements. A CAP is a step-by-step plan of action and schedule for correcting a finding.

Successful implementation of a CAP is highly dependent on the planning that goes into it. To adequately address non-conformances, the CAP must, at a minimum:

1) Define the problem: The definition should clearly identify what happened, how significant it was, where it occurred in the system, and what type of problem it was (e.g. policy, process, procedure or culture). Remember: "If you cannot say it simply, you do not understand the problem."

2) Analyze the problem: The analysis should include a summary of the root cause as well as any causal factors that may have contributed to the problem. There are many techniques available to determine root cause: "5 Why's", "Fishbone", the maintenance error decision aid (MEDA) process, etc. Certificate holders must adopt a method that is appropriate for their organization. Regardless of which method is used, the organization must be able to demonstrate how they arrived at the root cause and what caused the non-conformance.

3) Identify the corrective action(s) required: The CAP should be documented and contain sufficient detail to describe what actions will be taken to address not only the specific examples of non-conformance and any associated immediate safety issues, but also the causal factors determined during the analysis of the problem.

If there are any induced hazards or risks associated with the implementation of the corrective actions, they should be assessed, mitigated or eliminated.

4) Set a clear timeline for the corrections to be implemented: Timelines should be aimed at implementing effective corrective actions in the shortest reasonable time period. There should be due dates, targets, and planned follow up to ensure effectiveness of the proposed corrections.

5) Identify responsibility for implementation: Clearly identify the person or persons within the organization who are responsible for implementing the actions.

6) Identify who is responsible for managerial approval: Identify an individual within the management structure who has the authority to commit the necessary resources required to fulfill the plan and can approve the CAP.

Taking the time to develop a comprehensive CAP will not only help certificate holders address findings but, more importantly, also help them continuously improve by preventing those findings from reoccurring. △

Celebrate the PNR's "Silver Anniversary" of Safety Speak!

The Prairie and Northern Region (PNR) encompasses approximately 60 percent of Canada's landmass, which creates unique opportunities for communication. "Communication between people working at Transport Canada and those working in the aviation industry is crucial to maintaining and enhancing safety," explains Kate Fletcher, the PNR's Regional Director of Civil Aviation. "Discussing current issues and sharing thoughts and ideas in person builds a culture of engagement conducive to achieving our shared goal of aviation safety."

For this reason, the PNR formed the Aviation Safety Council (ASC), which met for the first time in Edmonton, Alta., on October 16, 1997. As the number of participants increased, ASC meeting locations were rotated between Edmonton, Calgary, Winnipeg, Saskatoon, Yellowknife and Whitehorse. Recent meetings have included representatives of NAV CANADA, the Transportation Safety Board of Canada (TSB), airport authorities, aerodrome operators, airlines, small operators, flight training units (FTU), aircraft maintenance organizations and several industry associations.

The value of the ASC is clear to Herb Spear, the occupational health and safety representative for WestJet and a dedicated participant at the PNR's ASC meetings. "I value the ASC meetings because Transport Canada encourages industry to raise safety concerns," explains Herb. " I have witnessed Transport Canada's commitment to responding to those concerns, whether voiced by an operator or an individual."

Since the beginning, the ASC has remained true to its original objective, which is to provide an opportunity for participants to identify safety issues and exchange information so regulators and industry can work collaboratively to ensure Canada's air transportation system remains safe.

The 25th meeting of the ASC will take place on **Tuesday, November 30**, 2010, in **Calgary, Alta.** To attend, please register with Carol Beauchamp by e-mail at carol.beauchamp@tc.gc.ca. This special event will be limited to 125 participants, so please register as soon as possible.

Transport Canada's Safety Management Systems (SMS)
Information Session
Fairmont The Queen Elizabeth Hotel
Montréal, Quebec
November 24–25, 2010
www.tc.gc.ca/civilaviation/SMS/Info/menu.htm

Major Accident Report: Bell 206 Down in Cranbrook, B.C. ..... page 9
What Went Wrong: In-Flight Blackout ..... page 12
Assumptions ..... page 14

Major Accident Report: Bell 206 Down in Cranbrook, B.C.

The following is a condensed version of Transportation Safety Board of Canada (TSB) Final Report A08P0125, on the fatal crash of a Bell 206B Jet Ranger helicopter in Cranbrook, British Columbia. Readers are encouraged to read the full report on-line at www.tsb.gc.ca.

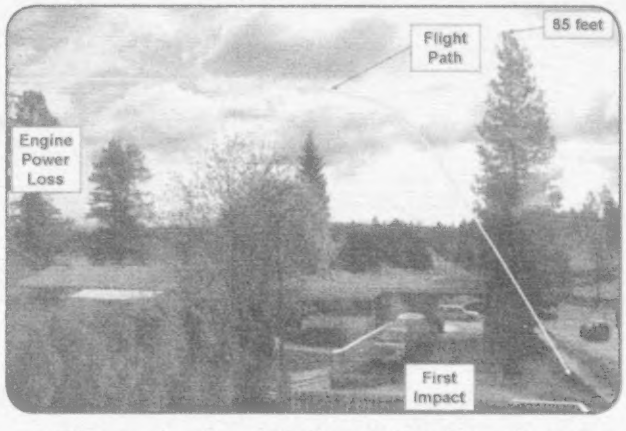
Summary
On May 13, 2008, a Bell 206B Jet Ranger with the pilot and two passengers on board took off on a mission to visually examine electrical power transmission lines that ran through the city of Cranbrook, B.C. To accomplish this task effectively, it was necessary for the inspection to be carried out at about 20 to 30 ft above the line or pole heights, at a ground speed of 25 kt. At about 13:06 Mountain Daylight Time (MDT), as the helicopter was flying southbound at about 120 ft above the ground, a sudden loss of engine power occurred causing rapid loss of rotor RPM. The helicopter descended quickly and landed heavily on a paved street below the flight path. The helicopter struck a pedestrian on the sidewalk adjacent to the impact point, as well as a motor vehicle. The helicopter broke into several pieces and burst into flames. The three occupants of the helicopter and the pedestrian were fatally injured at impact.

The aircraft was flying south-southwest over 14th Avenue (midway between 7th and 10th Streets), at about 120 ft above ground level (AGL) and 25 kt, when the engine lost power. The final few seconds of flight were uncontrollable and in free-fall from about 85 ft AGL. The weather conditions did not contribute to the accident circumstances, and the experienced pilot was certified and qualified for the flight. The helicopter was certified, equipped, and maintained in accordance with existing regulations and procedures.

The accident site was generally an open area but there were several obstructions that the pilot may have tried to avoid during descent, namely the residential power lines, tall trees, several houses, and vehicular traffic. Given those obstructions, it is unlikely that the pilot saw either the pedestrian or the car before impact. The airframe wreckage was examined to the extent possible by the TSB, and for the few airframe components that did survive the fire, no indication was found of any pre-accident anomaly or malfunction. The TSB also determined that the weight, centre of gravity (CG), as well as hover out of ground effect (HOGE) performance were all within prescribed limits.

The engine, fuel control unit (FCU) and power turbine governor (PTG) were disassembled and examined in detail. They had been exposed to extreme temperatures during the post-crash fire and had suffered significant damage. The TSB tests showed no mechanical anomaly that could have affected their function; however, a latent malfunction of either the FCU or the PTG could not be ruled out. *(For more details, including references to a 2005 investigation on a similar PTG, readers should refer to the complete TSB Final Report on the TSB's Web site. —Ed.)*

Helicopter autorotation
A critical aspect of autorotation is the entry manoeuvre immediately following the loss of engine power because the pilot must react quickly to conserve rotor RPM. Of the other factors affecting autorotative flight, the altitude at the time of the loss of engine power immediately establishes several important elements of successful descent and landing. The greater the height above the landing surface, the greater choice of suitable landing areas, the more time to establish and maintain control of the helicopter, and the longer the glide distance. Low-altitude flight reduces all these margins to the point where successful autorotative flight and landing may be impossible.



Telemetry data from the helicopter allowed investigators to recreate the flight path, depicted above.

The no-engine landing after an autorotative descent is a challenging manoeuvre for any helicopter pilot

since it involves skills not frequently practiced within an unforgiving flight regime. For this accident, several obstacles greatly restricted the pilot's manoeuvring and choice of landing sites. Further, he was faced with the dilemma of extending the glide to avoid the houses at the expense of controlled flight. In these circumstances, the pilot had insufficient altitude to maintain functional rotor RPM following the engine power loss, and the final few seconds of flight were uncontrollable and in free-fall from about 85 ft above the road.

Tail rotor unit shown at the accident scene. The main and tail rotor blades were relatively undamaged.

Height velocity diagram

The height velocity diagram (HVD) (see next page) shows, in graph format, those combinations of airspeed and height above the ground where either a fully developed autorotative glide can be entered or a safe landing carried out after the single-engine helicopter suffers an engine power loss. The HVD is not a limitation in the flight manual, but rather a guide to show the flight profiles where pilots are exposed to the greatest risk resulting from engine power loss, and so identifies height and speed combinations to avoid or pass through quickly. The HVD for the Bell 206B shows that a pilot should not expect to establish full autorotation from heights between 40 and 200 ft AGL, unless the airspeed is above 45 mph. In this case, the helicopter was at about 120 ft AGL and travelling at about 30 mph; with such height and speed, the helicopter could not have achieved full autorotation before it struck the ground.

Regulatory requirements for flight over built-up areas

The following sections of the *Canadian Aviation Regulations* (CARs) and *Commercial Air Service Standards* (CASS) prescribe the altitudes at which aircraft may be flown: CAR 602.14—*Minimum Altitudes and Distance*; CAR 602.15—*Permissible Low Altitude Flight*; CAR 702.22—*Built-Up Area and Aerial Work Zone*; and CASS 722.22—*Built up Area and Aerial Work Zone*. The accident flight was involved in aerial inspection as a commercial operation, in which case it would be bound by the requirements of Part VII of the CARs.

The company was operating under the auspices of its subpart 702 certificate—Aerial Work. Subsection 702.22(2) allows a person to operate over a built-up area at altitudes and distances less than the general prohibition if the person: is so authorized by the Minister, or is authorized to do so in an air operator certificate; and complies with the CASS. To obtain such authority, subsection 722.22(1) of the CASS requires an aerial work zone plan to be submitted to the Transport Canada Aviation Regional Office at least five working days in advance of the operation, and prescribes the information that must be submitted. Furthermore, subsection 722.22(3) lists additional requirements related to this application. In this case, the operator had not applied for, or received, authorization from the Minister of Transport, nor had it submitted an aerial work zone plan.

Low-altitude aerial inspection flights over built-up areas have been undertaken in Canada for at least the past 30 years, and regulatory requirements for such flights have existed in one form or another throughout. The TSB determined that much misunderstanding exists regarding the interpretation and application of altitude requirements in the CARs and associated CASS. In all likelihood, low-altitude aerial inspection flights are being carried out over built-up areas in Canada without full compliance with regulatory requirements.

Analysis

The cause of the loss of engine power was not determined. No evidence was found to suggest that any of the engine modules had suffered any pre-impact mechanical event that would have contributed to a loss of engine power. The accident FCU and PTG were damaged, and while it is possible that either one malfunctioned, the TSB could not make a definitive conclusion on them.

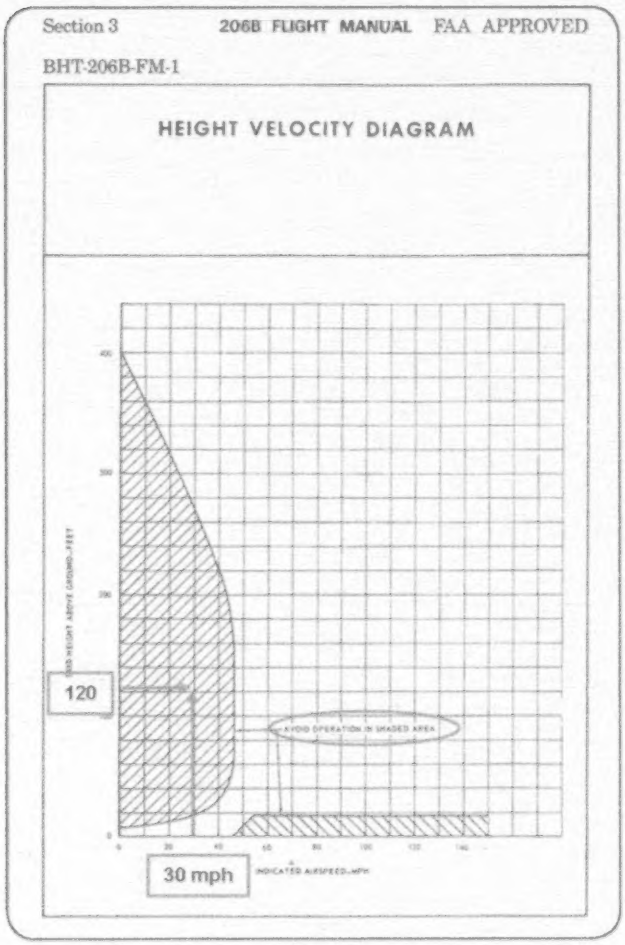
Several operational conditions existed to present the pilot with a greater-than-usual challenge for an emergency landing following the loss of engine power, namely:

- obstructions on the final flight path;
- low airspeed;
- low height above the terrain;
- low rotor RPM; and
- short time frame.

The above factors individually represent significant difficulty for a pilot to achieve a successful outcome, but when combined, they pose operational challenges that a pilot may not overcome.

The HVD shows that low altitude and low airspeed combinations present a significant challenge to pilots

in landing successfully from an event that requires an immediate landing. On the diagram, such higher-risk zones are labelled "avoid" areas and represent the worst circumstances for recovery. The accident helicopter was frequently exposed to the higher-risk avoid zones of the HVD during its passage over the built-up areas of Cranbrook.



Height velocity diagram

The CARs prescribe conditions for low-altitude flight in helicopters over built-up areas that, in general, ensure the manner of operation does not create a hazard, and that the altitude (height) of a flight is such that an immediate landing can be made without creating a hazard. Information contained in the flight manuals (such as the HVD) assist operators and pilots in choosing the most appropriate flight profiles for their missions and take into account helicopter performance. Accordingly, the final responsibility for safe operational practices remains with individual helicopter operators and pilots. The severity of this accident was influenced by the low altitude and airspeed, and the landing site environment.

The requirements governing flights over built-up areas are found in several areas of aviation regulation; they are complex and subject to wide interpretation, such as when an aircraft is or is not over a built-up area and which requirements would apply where and under what circumstances. The helicopter performed manoeuvres over homes in the vicinity of the power lines. Therefore, the accident flight took place over a built-up area. In the absence of clear direction and guidance, companies may select the requirements that impose the least stringent conditions. Therefore, low-level aerial inspection flights over built-up areas will continue, thereby creating a hazard to persons and property on the surface.

Findings as to causes and contributing factors

1. The engine lost power at an altitude and airspeed combination that did not permit fully developed autorotative flight, resulting in rapid loss of rotor RPM, an extremely high rate of descent, and a severe collision with the terrain.
2. The helicopter was being operated at a height and airspeed combination that the helicopter manufacturer had determined would, in the event of an engine power loss, preclude a successful descent and landing.
3. During the final seconds of the flight path, the pilot was hindered by several obstacles that afforded him only one clear landing site, which was beyond the gliding range of the helicopter. The pilot's efforts to avoid the house and reach that site exacerbated the already high rate of descent.
4. The helicopter was not in a controlled descent and, coupled with the decaying rotor RPM, the pilot's ability to control the helicopter was decreasing so rapidly that the last 85 ft of height were in free-fall.

Findings as to risk

1. Flights conducted at altitudes that do not permit safe descent, manoeuvring and landing following an event that requires a single-engine helicopter to land immediately create risk to persons and property, particularly in built-up areas.
2. The CARs requirements for low-level aerial inspection flights over built-up areas are complex and subject to wide interpretation. In the absence of clear direction and guidance, companies may select the requirements that impose the least stringent conditions. Therefore, low-level aerial inspection flights over built-up areas will continue, thereby creating a hazard to persons and property on the surface.

Safety action taken

Transport Canada (TC) had considered the publication in the ASL of a "logic chart" to guide pilots and operators in correct decision making regarding the minimum altitudes and distances over built-up areas prescribed by the CARs; however, upon further review, it was determined to be

inadvisable for the intended purpose, and that guidance in this area would be better included in the *Transport Canada Aeronautical Information Manual* (TC AIM). Therefore, TC is now planning to publish updated guidance on flight over built-up areas in a future update of the TC AIM.

The operator revised its operational practices regarding low-altitude flight and introduced a higher level of internal oversight. Additionally, it embarked upon a dedicated safety management system (SMS).

Finally, BC Hydro took immediate and long-term actions to address its policies and associated procedures concerning the use of helicopters, and the development and implementation of a more extensive helicopter management system. △

What Went Wrong: In-Flight Blackout

by R. Wicks. The following article was originally published in the March-April 2007 issue of Flight Safety Australia *and is reprinted with permission.*

An electrical fault knocks out several key systems including engine computers, NAV and COM equipment, flight instruments, flap, and landing gear.

I was transporting several passengers, and 10 NM from Adelaide [South Australia] in instrument meteorological conditions (IMC), when I heard a clunk from somewhere on the left side of the Cessna Conquest C441's cabin.

Light misty rain streaked up the windscreen and I was at 3 000 ft and had just been cleared for a Runway 05 VOR [VHF omnidirectional range] approach via the 10 NM arc.

The clunk was accompanied by the appearance of red flags on the primary attitude indicator (AI), horizontal situation indicator (HSI), and altimeter. The left-hand engine instruments were out too (torque, EGT [exhaust gas temperature], fuel flow, temperatures and pressures) and the left-hand fuel computer had tripped as well.

Without the fuel computer, which controls engine RPM and torque (among other things), the left-hand engine RPM surged from 96 to 100 percent. To make matters worse, the autopilot bell sounded to indicate that it had disconnected.

The priority was to fly the aircraft and see if I could work out what was happening. The artificial horizon (AH) on the co-pilot's side was operational, as was the co-pilot's directional gyro (DG).

I levelled the wings and increased the right-hand engine RPM to 100 percent to get rid of the distracting drone generated by the out-of-sync propellers.

With the aircraft stable, I had to make a decision about what I was going to do next. I called Adelaide Approach on COM1, but there was no response. I set the transponder to 7600, and checked VOR1—another red flag. How was I supposed to do an 05 VOR approach? Or even an ILS [instrument landing system]?

I made another call on the radio but there was no reply. My scan came to the GPS—yes, it was working! Thankfully, it was wired to the hot bus.

I was now 6 NM from Adelaide with a groundspeed of 180 kt—just two minutes from the airport. I was high, but that wouldn't be a problem in the Conquest.

With my local knowledge of the airport and the fact that I was arriving from the west, over the sea, I decided to descend until I could see the coast and make a visual approach.

Visibility was now about 2 km, and I could see the ocean below. I entered "direct to" in the Trimble and quickly got a bearing to the airport (I was surprised that I had turned right and needed a left turn of 20° to compensate.)

A Boeing 737 had started a VOR approach a few minutes before and I hoped the approach controller knew I was experiencing problems and was keeping us separated.

I selected approach flap but the electrically driven flap motor was silent. What about the landing gear? I moved the lever to the down position—again, no response. On top of everything else, I was going to have to carry out an emergency gear extension and make a flapless approach. A small bead of sweat formed on my lip—a sure sign of stress. I checked that the gear selector was down, pulled the circuit breaker and pulled the "T" handle—nothing!

I was barely a kilometre from the coast but still could not see it. What now? I was approaching the very limit of my reasoning ability with the intense pressure of the situation.

"Is everything alright?" asked the passenger next to me. I figured he was wondering why I kept looking at the AH on his side of the cabin. I answered, "Yes," then really yanked on the handle.

Yes—I had three greens! I could also just make out the faint outline of the coast. I did a quick landing check, extended the landing lights and turned off the right-hand fuel computer (both need to be off for a "manual" landing).

I flashed my landing lights and got a green flash in return from the tower, indicating I was cleared to land.

We touched down safely and I remembered not to use reverse thrust with the fuel computers not functioning. After landing, I received a green light to taxi and park the aircraft, though my troubles weren't quite over. The "stop" button failed to shut down the left engine and in the end I had to use the condition lever, which cuts off the fuel, to bring it to a halt.

Several passengers thanked me for a great flight as they disembarked. If only they knew!

What happened? The rear bearing in the left-hand starter generator failed, causing the armature to short on the casing. Consequently, the 225-amp current-limiter blew and all items on the left-hand main bus failed.

Following this incident, the company obtained a diagram showing the aircraft's electrical distribution. This diagram is not included in the pilot's operating handbook.

Although COM2 was functioning, this aircraft had only one audio panel and its "Emerg" position supplies power to audio panel one for transmission on COM1.

NAV2 had been working, though I didn't realize it until I was visual. I spoke to the approach controller later and he told me there was no issue with the B737. He instructed the jet to overshoot when he lost my paint and couldn't reach me on the radio. Well done!

Analysis (by Mike Smith, aviation consultant)
Good situational awareness, prioritization of tasks and sound decision-making skills helped this pilot out of a very unpleasant situation. It is often said that single-pilot IFR flying is one of the most challenging tasks a pilot can undertake and it is because of precisely this type of occurrence that it is so challenging.

An instrument approach in cloud and rain, and in a complex aircraft such as the Conquest, when everything is going well is hard enough; add in the failure of some essential equipment, and the workload can become so great that sound decision making often goes out the window.

This pilot had good situational awareness and he used that to his advantage to solve the problem caused by the loss of his primary VOR. Becoming visual over the sea and making a visual approach over familiar terrain would have eased his workload considerably. He also had a fair idea about the position of the 737 and presumed correctly that ATC would take care of the situation.

The electrical system on the Conquest is designed to cope with numerous failures and still retain the ability to operate flight-critical systems. In this case, not only did the left engine starter-generator fail but it also caused a short that blew the associated current limiter.

Were it just a straight-out generator failure, without a short, the problem would be simple; in all likelihood, the right engine starter-generator would have continued to power most aircraft systems through the tie-bus. The pilot would have been alerted to the off-line left-hand generator and would simply have had to manage electrical load to below the capacity of the remaining generator, in the case of the Conquest, about 200 amps.

But the short apparently caused the current limiter to isolate the left-hand main bus from the available electrical supply. It may be possible that power could have been restored but that would have required a detailed knowledge of the electrical distribution system and that information was not available to our pilot. It is pleasing to read that the company has now made available the necessary information for its pilots.

In any case, with the high workload occasioned by the instrument approach and the loss of several aircraft systems, including engine computers, NAV and COM equipment, flight instruments, flap, and landing gear, this pilot made a series of wise decisions that eased his workload and enabled him to concentrate on a safe visual approach and landing.

How well do you know the systems on the aircraft you fly? What's it like to do an emergency gear extension for real? What's the effect on landing distance of having no flap or engine reverse thrust available?

The airlines have comprehensive training and checking regimes, and the advantage of flight simulators to ensure their crews are current and equipped to deal with the sort of emergency this pilot experienced. Most of us flying single-pilot IFR, like the pilot in this story, do not have this facility, so constant review of aircraft systems and drills is necessary to ensure our mental workload is not too taxing when something does go wrong. △

Assumptions

by Steven Schmidt. This article was originally published in the November-December 2008 issue of Flight Safety Australia, *and is reprinted with permission.*

It was the mid-80's and I'd just earned a level 2 (junior) instructors' ticket at a gliding field in central Victoria [Australia]. The previous week had been wet, and it was touch and go whether we operated at all.

We decided to operate with one aircraft—a two-seater tandem trainer called a Blanik. It had medium performance and behaved well on the winch. By operating only one aircraft with an instructor required on board, the CFI [chief flight instructor] was confident we could keep operations to the centre of the landing strip and avoid getting bogged.

Debbie was my first customer for the day. She had been solo several years earlier, but her attendance to the field had been dropping off and her currency was decaying. Debbie could be described as a high maintenance pilot given to emotional outbursts and stubbornness.

To those on the ground, we missed each other by feet.

The single-glider operation resulted in a slow turnaround, and Debbie was obviously irritated by this. When I asked her to complete a pre-takeoff inspection of the aircraft I got an immediate and aggressive response.

"Why? I've just seen the glider take off and land without mishap." I responded with a pat answer and thought to myself that it was not a good beginning for an experienced pilot. I had a growing sense of foreboding.

We both jumped into the Blanik and strapped in. The retrieve car was still running out the cables from the winch, so we had plenty of time for a briefing.

"The day is stable so there will be no lift. It's a good opportunity for circuit practice and spot landing. I would like you to do the launch, circuit and landing as you have done many times before," I briefed Debbie.

Airmanship should always be practised. It's sad, but like common sense, often such states of mind seem very uncommon.

Propelled by the cable, she introduced back elevator smoothly, and we were climbing. I was in the back seat, where it is difficult to see at the best of times. As we started the launch, I caught a movement on the taxiway to our side. Once we had rotated into full climb, I could see a Piper Cherokee approaching the strip along the taxiway.

The launch was nearly text-book perfect and as we neared the top of the launch Debbie eased the elevator fractionally forward to release the tension on the cable before releasing. She established glide speed and completed her post-launch checks. Without prompting, she spent a few moments re-familiarising herself with the aircraft and entered the circuit. She ran through her pre-landing checks early and quickly. Once settled on the downwind leg I asked, "Anything unusual about this circuit you may consider planning for?"

"No," was her response.

"Well, if it were me I'd be planning for that Piper backtracking on the runway where we wish to land."

"Smartass!" was the reply.

We agreed to stay high in circuit to maximize our landing options.

As we turned onto the base leg the Piper stopped, facing us. "As large as the Blanik is, it still may be difficult to see. We have no radio, so 'S' turns will profile the aircraft and should make it easier to see us on base leg," I advised. At the same time the Piper did a 180-degree turn into wind and faced the end of the strip.

The Piper had stopped and did not move for the duration of our final leg. Debbie, who was now focused on the task declared, "He's stopped and waiting for us." I agreed, without further consideration.

Debbie established an aiming point for the landing deep within the strip. She was landing long to avoid the Piper and deployed the airbrakes to increase the descent rate accordingly. My focus now, like Debbie's, was on her landing.

Unbeknown to both of us was the fact that the Piper pilot, having completed his run-ups into wind, had pushed the throttle forward. To those on the ground, we missed each other by feet.

Debbie's landing was excellent, but my enthusiasm was immediately crushed with the news of the near collision. Later that evening the visibly shaking pilot of the Piper approached me. He seemed sorry but asked, "Why didn't you stay up longer? I saw you launch and expected that I had plenty of time to take off."

I replied, "It was a winter's day, stable and no lift except from the winch, average circuit times are 6–8 minutes depending upon the launch."

He then asked, "Why didn't you broadcast your intentions?"

With a little exasperation in my voice, I responded, "Our gliders do not have electrical systems and the Blaniks, which have been here for five years, have never had radios. We 'S' turned on base so you could see us." To which he replied, "You are too small to see." I took this reply with a grain of salt. The Blanik is almost 28 ft long with a wing span of 53 ft. I thought to myself that he didn't really look. I then asked, "Why, having turned into wind, did you not take off immediately?" He replied sheepishly that he had not done his pre-takeoff checks.

To which he replied, "You are too small to see." I took this reply with a grain of salt. The Blanik is almost 28 ft long with a wing span of 53 ft.

Twenty-five years later, I have different views. The Piper pilot clearly demonstrated poor airmanship irrespective of the breach of CARs [Australian *Civil Aviation Regulations*]. He did not think through his actions and put himself in a position where he could not observe incoming traffic, or give way to that traffic, as required by law and good sense. For our part, our lack of understanding of the need for a run-up into wind and pre-takeoff checks concluded in a naive assumption that the Piper pilot had seen us on final leg and was waiting for us to land.

I recognize that I had been distracted by Debbie's behaviour and a desire to pass on my training messages effectively, unfortunately at the cost of safety. Although visibility from the back seat, especially underneath the glider, was limited, I should have been more vigilant in checking her lookout, particularly in regards to the Piper. We still had height, whilst crossing the airfield threshold, to make some avoidance manoeuvres.

Airmanship should always be practised. It's sad, but like common sense, often such states of mind seem very uncommon. Having said this, we must still always strive for that elusive goal, for all our sakes. △

TC AIM Snapshot—Flight Operations in Rain

An error in vision can occur when flying in rain. The presence of rain on the windscreen, in addition to causing poor visibility, introduces a refraction error. This error is because of two things: firstly, the reduced transparency of the rain-covered windscreen causes the eye to see a horizon below the true one (because of the eye response to the relative brightness of the upper bright part and the lower dark part); and secondly, the shape and pattern of the ripples formed on the windscreen, particularly on sloping ones, which cause objects to appear lower. The error may be present as a result of one or other of the two causes, or of both, in which case it is cumulative and is of the order of about 5° in angle. Therefore, a hilltop or peak ½ NM ahead of an aircraft could appear to be approximately 260 ft lower, (230 ft lower at ½ SM) than it actually is.

Pilots should remember this additional hazard when flying in conditions of low visibility in rain and should maintain sufficient altitude and take other precautions, as necessary, to allow for the presence of this error. Also, pilots should ensure proper terrain clearance during enroute flight and on final approach to landing. *(Ref: Transport Canada Aeronautical Information Manual, Section AIR 2.5)*

2010-2011 Ground Icing Operations Update

In July 2010, the Winter 2010–2011 *Holdover Time (HOT) Guidelines* were published by Transport Canada. As per previous years, TP 14052, *Guidelines for Aircraft Ground Icing Operations*, should be used in conjunction with the *HOT Guidelines*. Both documents are available for download at the following Transport Canada Web site: www.tc.gc.ca/eng/civilaviation/standards/commerce-holdovertime-menu-1877.htm.

If you have any questions or comments regarding the above, please contact Doug Ingold at douglas.ingold@tc.gc.ca.

Call for Nominations for the 2011 Transport Canada Aviation Safety Award

Do you know someone who deserves to be recognized?

The Transport Canada Aviation Safety Award was established in 1988 to recognize persons, groups, companies, organizations, agencies or departments that have contributed, in an exceptional way, to aviation safety in Canada.

The Award—a certificate and letter signed by the Minister of Transport—is presented to the recipient the week of National Aviation Day (February 23).

Eligibility

Any individual, group, company, organization, agency or department may be nominated for this Award. The nominee must be a Canadian-owned organization or a resident of Canada.

Nomination categories

Nominations must demonstrate that the contribution to aviation safety meets at least one of the following:

a. A demonstrated commitment and an exceptional dedication to Canadian aviation safety over an extended period of time (three years or longer);

b. The successful completion of a program or research project that has had a significant impact on Canadian public aviation safety;

c. An outstanding act, effort, contribution or service to aviation safety.

The closing date for nominations for the 2011 award is December 7, 2010. For complete details, including the on-line nomination form, visit:

www.tc.gc.ca/aviation-safety-award.

Answers to the 2010 Self-Paced Study Program

1. year, month, day, hour and minutes
2. 22:02 Mountain Daylight Time
3. extricate any person; prevent destruction by fire or other cause; avoid danger to any person or property
4. PPR: Obtain the aerodrome operator's permission prior to use.
5. PNR: Notify the aerodrome owner or operator prior to use in order that current information on the aerodrome may be provided.
6. Bearing and heading information to the site.
7. No.
8. The identification of the ATS unit (FSS or FIC) controlling the RCO, the aircraft identification and the name of the location of the RCO followed by R-C-O in a non-phonetic form.
9. 122.75.
10. above ground level (AGL); above sea level (ASL).
11. Unorganized scattered clouds are forecast based at 3 000 ft ASL with tops at 5 000 ft ASL.
12. From the 28th day of the month at 1200Z to the 29th day of the month at 1200Z.
13. Wind shear is forecast to exist in the layer from the surface to 1 100 ft AGL, with the wind at the shear height of 270° true at 50 kt.
14. Wind light and variable, temperature -15°C.
15. YXU (London VOR) 090° radial at 10 NM.
16. Inform ATC of this fact, since acknowledgement of the clearance alone will be taken by a controller as indicating acceptance.
17. Class C requires a clearance, Class D requires communication.
18. 14 lbs or 6.4 kg.
19. The ATS unit will activate the flight plan or flight itinerary, using the estimated time of departure (ETD) as the actual time of departure (ATD).
20. No.
21. broadcast.
22. 15 NM.
23. 406 MHz.
24. www.navcanada.ca under "Aeronautical Information Products".
25. NOTAM, VFR chart updating data, VFR chart.
26. Information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard.
27. 60
28. Complete a flight review with an instructor, attend a safety seminar conducted by Transport Canada, participate in an approved recurrent training program, complete this self-paced study program, complete a pilot proficiency check (PPC), complete the requirements for the issue or renewal of a licence, permit or rating, or complete the written exam for a licence, permit or rating.
29. ± 50 ft
30. 24 hours; be assessed by a health-care provider
31. List might include kits, basic survival manual and other resources.
32. Hold in all free lines, control lines and hoses to avoid entanglement
33. no less than the greater of (i) 100 ft, and (ii) the greatest dimension of the balloon, be it the length, width or height, plus 25 percent.
34. the first day of the month following the day on which the medical examination for the issuance or renewal of the certificate is conducted.
35. minimum sink speed
36. 70 kt. Add an amount equal to half the gust factor of 10 kt.
37. 10 kt.
38. Stay above the rising snow and wait until solid references appear beneath the aircraft.
39. lowering the collective
40. training
41. high; small

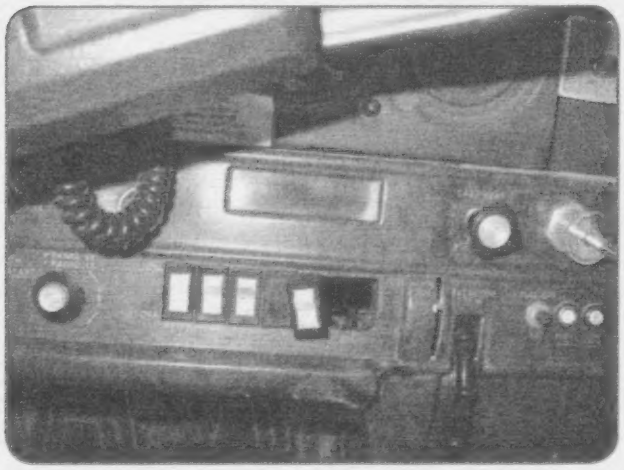
Smoke in the Cabin—Landing Light Switch Failure ..... page 17
Canada-U.S. Bilateral Aviation Safety Agreement ..... page 19

Smoke in the Cabin—Landing Light Switch Failure

The following occurrence resulted in two aviation safety advisories from the Transportation Safety Board of Canada (TSB).

Background

On September 24, 2007, a Cessna 152 aircraft took off from the Oshawa Municipal Airport, Ont., with the pilot and passenger on board, destined to Kingston, Ont. Just after clearing the control zone, the pilot and passenger noticed an electrical odour and observed a small fire and smoke emanating from the bottom of the left dash panel where the aircraft lighting switches were located. The passenger, sitting in the right front seat, reached for and discharged the fire extinguisher. The fire was quickly extinguished, but the extinguishing agent clouded the cockpit, reducing visibility. The cockpit windows were opened and visibility improved considerably. The aircraft returned to the Oshawa airport and landed without further incident. The pilot suffered a minor burn to his leg when the plastic instrument panel melted and dripped onto his jeans. The TSB issued Final Report A07O0264 on January 14, 2009, regarding this occurrence.



Front of instrument panel

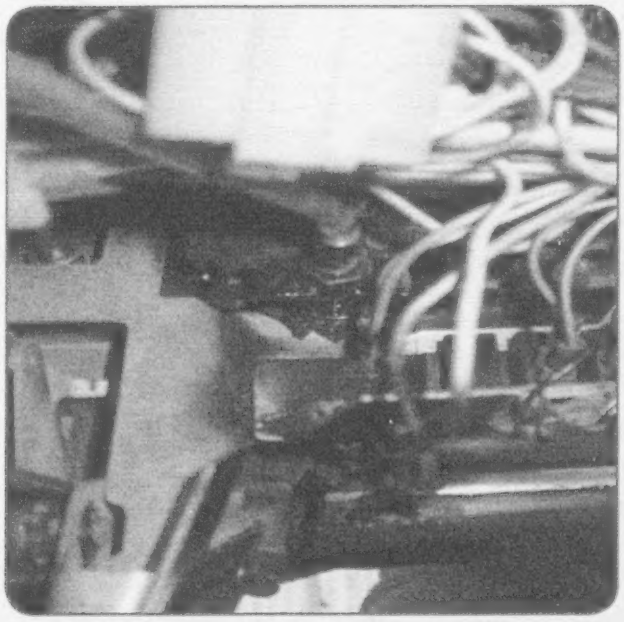
The TSB determined that the landing light switch installed in the occurrence aircraft was beyond its design capability and therefore was unsuitable for the circuit it was controlling. Excessive heat from arcing and oxidization within the switch weakened the switch structure and contact support, allowing the contacts to fall out or be exposed. Arcing from the contacts caused oil residue to flash, which ignited a nearby dust accumulation and started the fire. Combustion was sustained by the plastic instrument panel. The TSB stated that similar landing light switch systems are incorporated on most of the Cessna 100-series aircraft, thereby increasing the likelihood of a similar event. The TSB issued two aviation safety advisories as a result of their investigation.

Advisory No. 1: Landing light switch failure

The landing light electrical circuit is composed of a 15-amp push-to-reset circuit breaker in series with a single pole, single throw rocker switch, which is in series with a 28 VDC 250-watt incandescent lamp. The switch and the circuit breaker are located on the lower instrument panel to the right of and above the pilot's knee when seated in the left-hand seat. The engine oil pressure and temperature gauges are located directly above the landing light switch. The oil pressure gauge is connected to the oil-carrying pressure line, which is directly connected to the engine. This type of circuit and instrument panel layout are common amongst the 100-series Cessna aircraft.

The switch was identified as a rocker-style switch rated at 10A 250VAC, 15A 125VAC, 3/4HP125-250 VAC. No DC ratings were found for this switch. The switch showed evidence of melt damage beginning at the base and progressing upward on both sides. The same damage was evident on the interior of the switch. The switch exterior had a thick coating of dust and an oily residue, which was also found inside the switch. A scanning electron microscope (SEM) and energy dispersive spectroscopy (EDS) analysis of the residue indicated that it might have been engine oil.

The landing light circuit wires remained attached to the contact but showed evidence of fire damage near where the contact enters the switch. The contact was coated with the plastic casing material and when the surface was examined there was evidence of repeated arcing, which had severely eroded the contact's surface. Arcing within the landing light switch could have provided the ignition source necessary for a fire to start. The dust covering evident on the switch and the oil residue provided by possible seepage from the oil pressure gauge line located above the switch may have provided the kindling necessary to start a fire. The oil would consistently reach its flash point when exposed to arcing, and when it was in proximity to the dust it would cause the dust to ignite. A small section of the plastic instrument panel was tested for flammability by introducing a direct flame to the



Rear of instrument panel

plastic. The piece of panel readily ignited and sustained flame. It also produced gases that were quite harsh when inhaled, and without sufficient ventilation may cause some incapacitation to the pilot.

According to the U.S. Federal Aviation Administration (FAA) Advisory Circular 43.13-1B, chapter 11 (pages 11–17), because of the initial current encountered by switches controlling 28 VDC lamp loads (incandescent lamps), the switches should have a derating factor of 8. This aircraft's switch controls a 250-watt lamp in a circuit powered by 28 VDC, and should have a minimum DC current rating of 71 amps. The switch from the aircraft had an AC rating. The Advisory Circular has a warning that reads "**Do not use AC derated switches in DC circuits. AC switches will not carry the same amperage as a DC switch.**" The switch manufacturer was contacted and provided with the landing light circuit and switch information. After evaluating the information, they confirmed that the switch was not designed to handle the lamp loads described.

The circuit breaker was identified as a 15-amp push-to-reset circuit breaker (CB), Cessna part number S1360-15L. The purpose of the CB in the circuit is to protect the circuit wiring, not the components attached to the wiring. The 15-amp thermal-type CB was found to be suitable for the circuit. The CB did not trip after the occurrence but, being the thermal-type of CB, it does not react instantaneously to an over-current condition. This feature is necessary because when the light switch is selected "ON", the initial current can be as high as 15 times its rated load. If the CB were to react instantly to the initial current it would trip every time the switch was selected "ON".

A search of the FAA's service difficulty report (SDR) database by the TSB revealed 23 events similar to this occurrence. The common terms were: smell or smoke in cockpit, landing light switch hot, landing light switch arcing, landing light switch melted, and circuit breaker did not trip.

Due to the number of these aircraft presently in use worldwide, including in flight training schools, the possibility that this type of event may recur on aircraft that have the AC-rated landing light switch installed cannot be discounted. If this type of event were to occur to an inexperienced pilot, or to a student-pilot on a solo flight, the pilot's attention could be diverted from flying the aircraft to focus on extinguishing the fire, with possible dire consequences.

The TSB suggested that Transport Canada (TC), in co-ordination with the FAA and the aircraft manufacturer, may wish to take action to mitigate or eliminate the threat of fire caused by AC-rated switches in the landing light DC circuit of Cessna 152 aircraft.

Advisory No. 2: Smoke-in-cabin emergency procedures

The pilot and passenger followed the emergency procedures for an electrical fire in the cabin, as per the pilot's operating handbook (POH). The procedures were performed from memory only. Acting on their own instincts, they decided to open the two cabin windows to quickly improve visibility and improve air quality in the confined area of the cockpit. Their quick actions were successful and the pilot was able to re-channel his full attention to safely flying the aircraft back to the airport.

Reported cases of smoke in the cockpit abound in various types of general aviation (GA) aircraft worldwide. A pilot's ability to fly the aircraft safely is degraded by the presence of smoke and extinguishing agents in the cockpit. Taking action to remove the smoke and fumes from extinguishing agents would increase visibility and improve the air quality within the aircraft.

To ensure that pilots can quickly eliminate smoke and extinguishing agent fumes from the cockpit, further checklist or procedural items may be required. The TSB therefore suggested that TC, in concert with manufacturers and the regulatory authorities of other countries, may wish to review emergency checklist procedures dealing with smoke and fire on GA aircraft and to include an additional step to eliminate smoke or fumes.

Safety action taken
TC contacted the FAA, the authority for the state of design, requesting their position and possible corrective action. The FAA approached Cessna who developed a corrective action plan.

Landing light switch
The FAA took action to mitigate or eliminate the threat of fire caused by AC-rated switches in the landing light DC circuit of Cessna 152 aircraft. Cessna co-operated with the FAA by issuing Mandatory Service Bulletins MEB09-3 and SEB09-6 dated May 11, 2009, to remove and replace all subject switches used in the landing light as well as the taxi light and rotating beacon circuits in the 100-, 200- and 300-series Cessna models with service life greater than four years. This includes the Cessna 152-series aircraft. These bulletins are to be accomplished within the next 400 hours of operation, or 12 calendar months, whichever comes first. A review of the database shows less than 1 percent of the fleet has been affected by this type of failure. Therefore, the FAA's course of action has been to disseminate the concern by issuing a Special Airworthiness Information Bulletin (SAIB) CE-09-42, which is available at www.faa.gov/aircraft/safety/alerts/SAIB/.

Smoke-in-cabin emergency procedures
The FAA took action by reviewing the emergency checklist procedures dealing with smoke and fire in GA aircraft and including additional steps to eliminate smoke or fumes. The FAA's course of action has been to disseminate this information by issuing SAIB CE-10-04, which is available at www.faa.gov/aircraft/safety/alerts/SAIB/. It recommends that owners and operators check their POH or aircraft flight manual (AFM) and add a statement: "to remove smoke and fumes from the cockpit, do the following..." If such a statement does not exist in their POH or AFM, owners and operators are encouraged to contact the aircraft manufacturer for checklist instructions for the removal of smoke or fumes from the cockpit (e.g. closing or opening heating, air-conditioning, or air vents).

Considering the FAA's issuance of the corresponding SAIB and that Cessna has forwarded the applicable service information to all subscribers of such publications, TC has not taken any additional action at this time.

In closing, TC would like to remind the community that defects, malfunctions and failures occurring on aeronautical products should be reported to Transport Canada, Continuing Airworthiness in accordance with Canadian Aviation Regulation *(CAR) 521 mandatory SDR requirements. These reports will serve as supporting documentation to present to the authority for the state of design or the manufacturer when corrective action is necessary.* △

Canada-U.S. Bilateral Aviation Safety Agreement

by Joel Virtanen, Civil Aviation Safety Inspector, Maintenance and Manufacturing, Standards, Civil Aviation, Transport Canada

It has recently come to Transport Canada Civil Aviation's (TCCA) attention that more awareness is required on the impact of international agreements on the Canadian aviation industry. This article will help address this concern by focusing on the Canada-U.S. Bilateral Aviation Safety Agreement (BASA), its associated maintenance implementation procedures (MIP), and how they apply to aviation professionals in Canada.

On June 12, 2000, Canada and the United States signed the BASA and designated their respective civil aviation authorities as the executive agents for its implementation. The Agreement can be viewed at: www.tc.gc.ca/eng/civilaviation/standards/int-baa-usa-2000-3676.htm.

The BASA provides for, among other things, the reciprocal acceptance of airworthiness approvals and environmental testing and approval of civil aeronautical products, as well as approvals and monitoring of maintenance, alteration and/or modification facilities, maintenance training organizations, and maintenance personnel.

Article III (B) of the BASA required that the U.S. Federal Aviation Administration (FAA) and TCCA—being the executive agents for the Parties—draft written methods by which such reciprocal acceptances would be made. This documented process is referred to as the Implementation Procedures generally, and the detailed procedure for the reciprocal acceptance of maintenance activities and personnel is described in the MIP. The MIP can be viewed at: www.tc.gc.ca/eng/civilaviation/standards/int-ta-usaimp2006-menu-3700.htm.

The objective of the MIP is to outline the terms and conditions under which the FAA and TCCA can accept each other's inspections and evaluations, including FAA-approved *Federal Aviation Regulations* (FARs) Part 145 repair stations and Canadian approved maintenance organizations (AMO). The MIP also applies to FAA-certificated airmen and Canadian aircraft maintenance engineers (AME). As a result, the findings of compliance and regulatory oversight by either agency will be accepted by the other agency. This will lead to a reduction in redundant inspections without adversely affecting aviation safety.

At the heart of the MIP is the requirement for a Canadian operator or AMO performing maintenance on U.S.-registered aircraft to first comply with its own maintenance regulatory requirements—including those prescribed by *Canadian Aviation Regulations* (CARs) Part V, Subparts 71 and 73—and then with the special requirements prescribed by the FAA and described in the MIP. The reverse is true for FAA-approved Part 145 repair stations performing maintenance on Canadian-registered aircraft—they must first comply with U.S. maintenance regulatory requirements, and then with the special requirements prescribed by TCCA.

AMOs and FAA-approved Part 145 repair stations must develop and incorporate a supplement to their own approved maintenance policy manual, or equivalent. The supplement must address all of the other aviation authority's special requirements, as identified in the MIP. The completed supplement must be submitted to the organization's own civil airworthiness authority for approval.

Who needs a supplement?
Any Canadian AMO working on U.S.-registered Part 121 or 135 aircraft requires a TCCA-approved FAA supplement to their Maintenance Policy Manual (MPM). The supplement must meet all of the conditions outlined in Chapter 3 of the MIP, which identifies the special conditions set forth by each respective civil aviation authority. Interestingly, it is TCCA that will approve the FAA supplement, and not the FAA.

Any Canadian CAR Part VII operator who has work done on their aircraft in the United States by an FAA-approved Part 145 repair station must ensure that the repair station has an FAA-approved Canadian supplement to their Repair Station Manual (RSM). It is important to note that neither the FAA nor TCCA will issue a supplement approval number in respect of approved maintenance facilities. **It is the operator's responsibility to ensure that the facilities that they intend to use are approved.**

What is in a supplement?
The supplement is essentially a bridging document for the differences between the requirements for Canadian AMOs and FAA-approved Part 145 repair stations. Some of the topics covered are: major repair reporting in accordance with the registered authority's requirements; reporting of service difficulties and suspected unapproved parts to the appropriate authority; requirements and procedures for repairs to be done in accordance with air carriers' procedures and with data approved by the authority of registry; requirements for major repairs to be signed by an Inspection Authorization in the U.S. and an independent AME in Canada; requirements for procedures to address the registered authority's airworthiness directives; requirements for procedures to control the maintenance; training program differences; procedures to ensure separation of quality assurance functions from maintenance functions; procedures to ensure that the work does not exceed the ratings or scope of the organization; a requirement to understand the English language (for Canadian AMOs); and a requirement to allow inspections by both authorities.

Who can sign off an annual inspection?
Annual inspections are excluded from the application of the BASA and MIP. A Canadian AME cannot sign off an annual inspection on U.S.-registered aircraft, and FAA-certificated airmen cannot sign off annual inspections on Canadian-registered aircraft. This situation exists due to the differences in our regulations and has been recognized and mutually agreed to by TCCA and the FAA.

How are components affected?
Overhauled and repaired components received from the United States with an Authorized Release Certificate (FAA form 8130-3, Airworthiness Approval Tag) are acceptable for use on Canadian-registered aircraft as long as the repaired parts or components are received from repair stations located within the continental United States, or the Districts of Columbia or Puerto Rico.

Maintenance conducted by FAA-approved foreign repair stations is not acceptable for use on Canadian aircraft since foreign repair stations are not covered by the BASA. Other international agreements should be consulted to determine the eligibility of repaired or overhauled aircraft, parts or components that originate from foreign jurisdictions.

Since operators could be affected by changes, and agreements are reviewed and revised from time to time, it is important to stay informed of the latest changes to the BASA. It is good practice to always check the document's revision date to see if amendments have been made since the document was last reviewed. Compliance with foreign agreements is necessary and relatively simple as long as you are familiar with the requirements. All international agreements are posted on the TCCA Web site: www.tc.gc.ca/eng/civilaviation/standards/int-menu-3668.htm. For further details and guidance, please refer to Advisory Circular (AC) 571-002—*Canada and United States Bilateral Aviation Safety Agreement Maintenance Implementation Procedures* at: www.tc.gc.ca/eng/civilaviation/opssvs/managementservices-referencecentre-acs-500-571-002-490.htm. △

RECENTLY RELEASED TSB REPORTS

The following summaries are extracted from Final Reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include the TSB's synopsis and selected findings. Some excerpts from the analysis section may be included, where needed, to better understand the findings. We encourage our readers to read the complete reports on the TSB Web site. For more information, contact the TSB or visit their Web site at www.tsb.gc.ca. *—Ed.*

TSB Final Report A06Q0190—Runway Overrun

On November 26, 2006, a Learjet 35A aircraft departed Brunswick, Georgia, United States, on a medical evacuation (MEDEVAC) flight to Montréal/Pierre Elliott Trudeau International Airport, Que. On board the aircraft were two pilots, two flight nurses, and two passengers. At 05:07 Eastern Standard Time (EST), the aircraft landed on Runway 06R at Montréal and overran the 9 600-ft runway, coming to rest approximately 600 ft off the end of the runway in a grass field. The aircraft sustained damage to the left wing leading edge and the fuselage. There were no injuries.

Findings as to causes and contributing factors

1. A "B" nut loosened, resulting in a leak and depletion of the hydraulic fluid and preventing normal operation of the flaps, spoilers, thrust reversers, and wheel brakes.
2. The crew did not notice that there was a loss of hydraulic pressure and therefore did not plan for a landing without normal stopping systems or for the use of the emergency brake system.
3. When the aircraft landed, the flaps were extended to only 20°, the spoilers did not deploy because there was no hydraulic or backup air pressure, the thrust reversers did not deploy, normal braking did not work, and the emergency brake system was not used. Consequently, the aircraft overran the runway.

Findings as to risk

1. The service and condition check carried out at intervals of 15 days may not assure proper fluid level. Therefore, confirmation of proper servicing rests on the completeness of the pre-flight inspection by the crew.
2. The flight crew's adopted practice of performing the "through-flight" checklist, when a normal pre-flight was required, allowed dispatching of the aircraft without confirming a proper fluid level in the hydraulic reservoir.
3. The pre-charged thrust reverser accumulator was not serviced according to the manufacturer's specifications, and there was insufficient air pressure to deploy the thrust reversers.
4. The aircraft flight manual (AFM) supplement for the thrust reverser does not provide guidelines on how to verify the accumulator air pressure. Consequently, the crew did not know how to properly check the thrust reverser accumulator pre-charge pressure.
5. The crew erroneously thought that the aircraft was equipped with a low-hydraulic-pressure light that would warn them in case of a loss of hydraulic-system pressure.
6. The AFM and the quick reference handbook (QRH) indicate that the low-hydraulic-pressure light illuminates to indicate loss of hydraulic-system pressure, although, in this aircraft, there was no low-hydraulic-pressure light.

Other finding

1. The aircraft departed for Montréal with an identified and undocumented defect that required maintenance action.

Safety action taken

As a result of the accident, the operator initiated an administrative investigation. The following actions have been taken:

- All company aircraft underwent extensive inspections of their hydraulic systems.
- Placards have been installed on hydraulic system accumulators indicating pressures and conditions that must be met prior to checking. Checking hydraulic accumulator pressure as well as thrust reverser accumulator pressure (if applicable) is mandatory during the normal exterior pre-flight and exterior post-flight inspections.
- The company director of human resources, the aviation safety officer, and the chief pilot discussed the accident with company employees.
- Exterior pre-flight inspections have been expanded beyond the manufacturer's approved procedures.

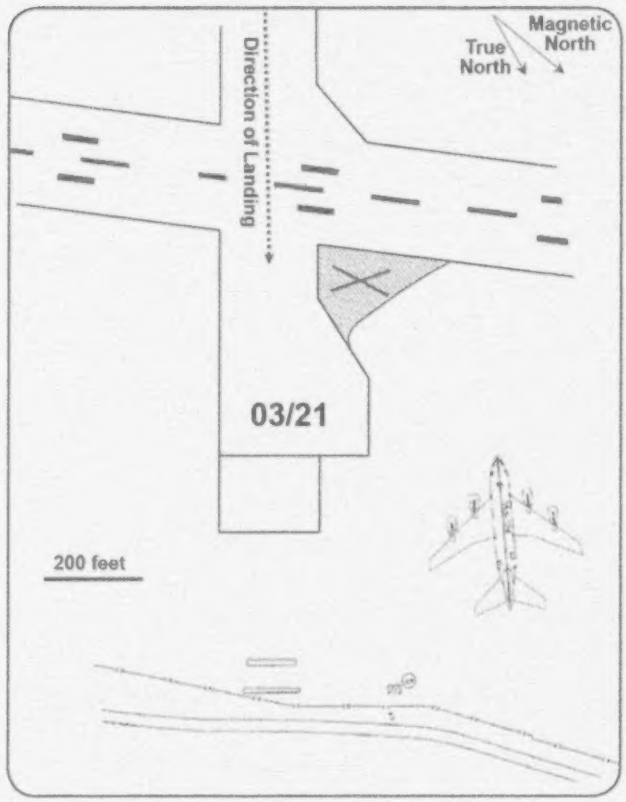
- Abnormal/emergency exercises that replicate this event have been incorporated into the company initial and recurrent flight training program.
- A review of the manufacturer's normal, abnormal, and emergency procedures is ongoing.
- Pilots have undergone additional training on the following:
  - standard operating procedures (SOPs);
  - Learjet 35 differences training;
  - emergency braking operating procedures;
  - enhanced ground proximity warning system (EGPWS) operation, alerts, and warnings;
  - requirements of the normal exterior pre-flight inspection, "through-flight" inspection, and post-flight inspection;
  - use of the minimum equipment list (MEL) as well as defect reporting and recording procedures; and
  - enhanced crew resource management (CRM) training with a focus on in-flight situation awareness and recognition of impending failures during all phases of flight.
- A review of the cockpit checklists is ongoing.
- The company aviation safety officer has been tasked with accelerating the development of the company safety management system (SMS) program.
- A significant restructuring of the company was undertaken.
- Operational co-ordination centre procedures were reviewed and refined to enhance operational control and technical dispatch procedures.

TSB Final Report A07A0029—Runway Excursion

On March 31, 2007, an Antonov AN 124-100 was on a flight from Greer, South Carolina, United States, to Gander, N.L. On arrival in Gander, the crew completed an approach to Runway 03/21. The aircraft touched down at 02:16 Newfoundland Daylight Time (NDT) but was unable to stop before reaching the end of the runway. It departed the left side of Runway 03/21, near the departure end, and came to rest approximately 480 ft off the runway surface, facing the opposite direction. Several edge lights along the runway were broken. The nine crew members and ten passengers on board the aircraft exited without injury. Aircraft damage was limited to cuts in the aircraft tires.

Analysis

There were no mechanical failures that contributed to the occurrence. Therefore, the analysis will focus on the awareness of runway conditions, the runway touchdown point, the delay in wheel braking, and the reduction in aircraft deceleration.



Final position of aircraft

The automatic terminal information service (ATIS) report received by the crew indicated that Runway 03/21 was bare and wet and that Runway 13/31 was the active runway. Twelve minutes before landing, the crew received a special weather observation indicating that light snow was falling. The fact that the latest weather observation was a special report and was reporting snowfall should have alerted the crew that weather conditions had changed and therefore the runway selected for landing may be contaminated. However, the crew did not request an updated runway surface condition (RSC) report.

Runway 13/31 had been designated as the active runway since the winds were light from the west. Active runways are chosen for various reasons, such as surface wind direction, the predominate direction from which aircraft are approaching, and taxi distance. Snow removal personnel and equipment were maintaining only Runway 13/31 before the occurrence.

The aircraft touched down approximately 2 400 ft beyond the normal touchdown point (3 400 ft minus 1 000 ft). The fact that the aircraft touched down long and at an airspeed 14 kt below the planned airspeed indicates that the aircraft floated this additional distance before touchdown. Considering that the runway was contaminated with snow, the reduced stopping distance

available greatly increased the chance of the aircraft being unable to stop on the remaining runway.

Wheel braking was applied by both pilots five seconds after the planned brake application speed of 135 kt. This brake application occurred 2 000 ft after the touchdown point, leaving only 4 800 ft of runway available for stopping the aircraft. The fact that both pilots were attempting to apply brake pressure simultaneously may indicate that both pilots were concerned about the stopping distance remaining.

Analysis of the recorded aircraft flight data indicated that the initial rate of deceleration may have been sufficient to stop the aircraft before the runway end. The crew did use reverse thrust after touchdown; however, it did not maintain maximum available reverse thrust until ensured of stopping on the available runway. Even though reverse thrust has little effect below 90 kt, that limited effect and the absence of residual forward thrust during the 15 s the idle power setting was restored may have been enough to prevent a runway overrun.

Findings as to causes and contributing factors

1. The aircraft touched down approximately 2 400 ft past the normal touchdown point; this greatly reduced the available stopping distance.
2. The contaminated runway surface condition increased the distance required to stop the aircraft.
3. The delay in the application of wheel brakes, combined with the failure to maintain maximum available reverse thrust until it was ensured that the aircraft would stop on the remaining runway, contributed to the overrun.

Safety action taken

The operator has made arrangements with the Gander International Airport Authority to have, upon request, Canadian Runway Friction Index (CRFI) reporting for each third of the runway.

Following this accident, the operator completed its own investigation and developed an in-house dedicated safety assurance program for the company's intensive flight operations via Gander Airport.

A TSB Aviation Safety Information letter has been sent to Transport Canada regarding Canadian differences with International Civil Aviation Organization (ICAO) recommended practices for reporting runway friction measurements.

TSB Final Report A07O0095—Landing Gear Collapse After Touchdown

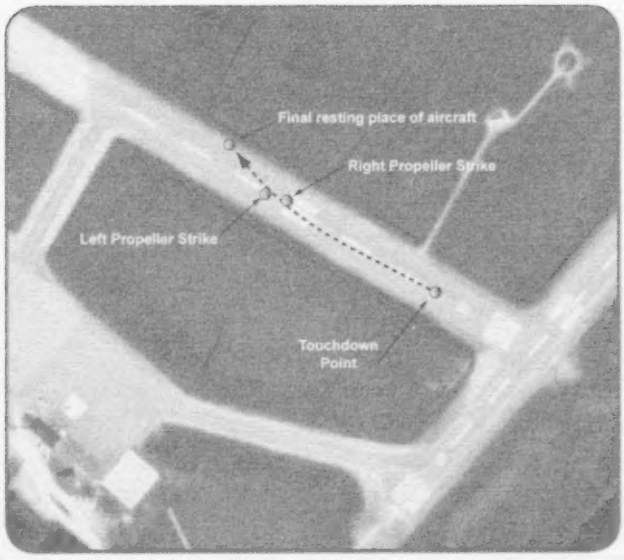
On April 9, 2007, a Piper PA31 aircraft departed a private grass strip with a pilot and passenger on board for a short flight to the Cochrane, Ont., airport to pick up another passenger. After departing Cochrane, the pilot flew to Moosonee, Ont., and conducted a VFR approach for Runway 32. Approximately 1.5 NM from the runway, the pilot selected the landing gear down and confirmed that the landing gear was indicating down and locked. This was also verbally confirmed by the passenger, another company pilot, who was sitting in the right seat. The aircraft landed normally, and the pilot selected flaps up and boost pumps off. The pilot was about to apply brakes to slow down for Taxiway Bravo when the gear horn sounded and the right main landing gear collapsed, followed quickly by the collapse of the left-main and nose landing gear. The aircraft came to rest approximately 1 550 ft from the threshold of Runway 32, just off the right side of the runway. There were no injuries.

Analysis

No faults were found with the aircraft that would indicate any mechanical failure or improper rigging of the landing gear. Retraction of the landing gear can only be accomplished if the down locks are removed during the retraction sequence. Therefore, due to the play in the landing gear handle, and the ease with which it could be bumped up, it is likely that the landing gear handle was inadvertently positioned above the locking solenoid before weight on wheels was achieved and that during the landing roll the handle was inadvertently bumped up far enough to begin the retraction sequence.

Findings as to causes and contributing factors

1. The spring in the landing gear handle was broken and allowed easy movement of the landing gear handle past the neutral stop.



Site diagram

2. During the approach, the landing gear handle was most likely placed in a position that bypassed the anti-retraction system.

3. The landing gear handle inadvertently moved to an "UP" selection during the landing roll, which activated the gear warning horn and retracted the landing gear.

TSB Final Report A07O0165—Collision with Terrain

On June 30, 2007, a privately owned Piper Cub J3C-65 departed a privately owned, grass-covered runway near Essex, Ont., under visual meteorological conditions (VMC). This was the first flight following the annual maintenance inspection of the aircraft. Shortly after departure, the aircraft made a planned low pass parallel to the runway in an easterly direction. The aircraft then climbed to approximately 1 500 ft above ground level (AGL) in a northerly direction. Shortly afterwards, the aircraft was observed in a gradual descent, flying in a southeasterly direction. At approximately 14:20 Eastern Daylight Time (EDT), the aircraft struck the ground in a nearby field. The aircraft was destroyed by impact forces and a post-crash fire. The pilot, who was the sole occupant, did not survive.

Other factual information

There was nothing found to indicate that there was any airframe, engine, or system malfunction before or during the flight; weather conditions were ideal for VFR flight and were not considered a factor in the occurrence.

The highly experienced 80-year-old pilot had a history of chronic arterial fibrillation and therefore underwent periodic cardiovascular assessments. The post-mortem examination revealed that the pilot had underlying asymptomatic atherosclerotic coronary artery disease. This put him at risk for a sudden coronary event. The development of cardiovascular disease in licensed aviation personnel is a major concern among aviation medical practitioners. To address this concern, Transport Canada has developed a set of cardiovascular guidelines intended to assist in the medical assessment of cardiovascular fitness of licensed aviation personnel. These guidelines are published in Transport Canada's *Handbook for Civil Aviation Medical Examiners* (TP 13312E).

Major risk factors associated with cardiovascular disease are age, family history, hypertension, obesity, diabetes, abnormal blood lipids, and cigarette smoking. The aim of monitoring these risk factors and applying the cardiovascular guidelines is to ensure that the risk of asymptomatic coronary artery disease causing sudden incapacitation of a pilot remains extremely low.

The Transport Canada requirement for a Category 3 medical certificate is that the candidates undergo a routine electrocardiogram (ECG) at the first examination after age 40, and then subsequently within the four years preceding the examination. However, in up to 50 percent of people with advanced coronary artery disease, a routine ECG may not show indications of coronary artery disease. An exercise stress test increases the likelihood the disease will be detected. However, it is not part of the required screening process, but may form part of the medical assessment in those candidates with major risk factors.

Individuals with arterial fibrillation who have two or more of the five major risk factors—age over 65 years,

structural heart disease, diabetes, high blood pressure, and previous thromboembolism—are considered above the risk threshold limit for medical certification. The pilot was over the age of 65, with no indication that any of the other four risk factors were present at the time of the occurrence. Therefore, the applicant was deemed fit for medical certification.

Analysis

The aircraft, which had just undergone its annual inspection, was observed in controlled flight before it began a slow descending turn which ended when it struck the ground. There were no mechanical deficiencies found that could have contributed to the accident. It can be concluded that the gradual descent was not the result of an airframe or control system failure. Based on the manner in which the aircraft descended to the ground and on the post mortem examination which revealed well-established coronary artery disease, it is probable that the pilot suffered an acute coronary event during the flight. This resulted in incapacitation and the loss of control of the aircraft.

Finding as to causes and contributing factors

1. The pilot most likely suffered an incapacitating medical event due to well-established, underlying coronary artery disease that resulted in the loss of control of the aircraft.

TSB Final Report A07O0190—Guy-Wire Strike During Landing

On July 20, 2007, an Aerospatiale AS 350 B2 helicopter was attempting to land at a remote site near Moosonee, in northern Ontario. The selected landing area was a driveway near a communications tower, which was supported on three sides by multiple guy wires. The pilot chose to approach the driveway landing area by flying the helicopter sideways while maintaining forward visual contact with the selected landing area. As the helicopter moved sideways, the main rotor blades struck two of the top guy wires at a height of about 100 ft above ground level (AGL). The rotor blades were substantially damaged and the helicopter quickly descended and struck the ground in an inverted attitude.

The two passengers were able to extricate themselves, but could not extricate the pilot. One of the passengers knew about, and was able to get access to, a telephone located at the site. He used it to call the air ambulance unit in Moosonee. The air ambulance crew extricated the pilot from the wreckage and then transported the pilot and passengers to a local hospital. There was no fire. The emergency locator transmitter (ELT) did not activate.

One passenger received minor injuries. The pilot and the second passenger were seriously injured.

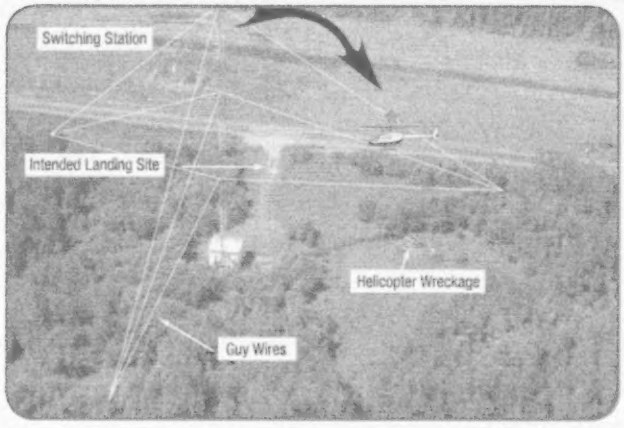
Analysis

There were no indications that weather or mechanical abnormalities were involved in this occurrence. The pilot was familiar with the site area and was experienced in the operation of the helicopter. The area selected to land the helicopter, although confined, was suitable for the landing. The pilot's decision to approach the landing site by flying the helicopter sideways to his left restricted his view of the approaching guy wires, significantly increasing the possibility of contact between the main rotors and the wires.

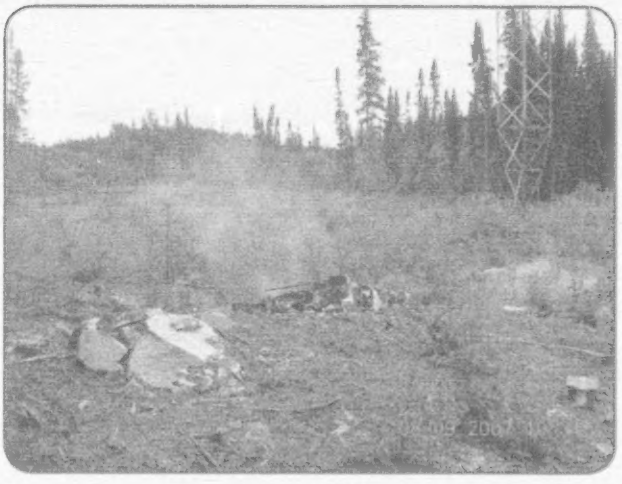
The structural damage to the main rotor blades rendered the helicopter uncontrollable and it became inverted and entangled on one of the wires during its descent to the ground. It is possible that the wire entanglement reduced the forces during ground impact and prevented further structural damage to the aircraft and injuries to the occupants.

The ELT did not activate even though impact forces exceeded the threshold of the G-switch. The type of G-switch used in this ELT was a single-axis, ball-and-spring-type switch. This type of switch will automatically activate the ELT only if a component of the impact force is in the same direction as the orientation of the switch.

During examination of the switch, black powder residue was found and the switch was seized within its casing; thus, electrical contact was never established and the ELT failed to activate. The ELT was properly attached and located in the cockpit of the helicopter as per current regulations, but the accident impact forces were in a direction that may not have activated the G-switch even if it had been serviceable. The failure of the ELT did not affect the rescue of the three injured persons because of the availability of phone service at the communications tower.



Accident site



Wreckage next to Tower 63

Finding as to causes and contributing factors

1. The helicopter struck the guy wires supporting the communications tower as a result of being flown in a left sideward direction, which prevented the pilot from viewing the approaching tower guy wires from his position in the right front seat while focused on the somewhat restricted landing area.

Findings as to risk

1. The single-axis, ball-and-spring G-switch in the ELT meets current specifications, but it is not effective when the impact forces are at angles that are substantially different to switch orientation.
2. The ELT failed to activate on impact as a result of a faulty internal G-switch. The internal parts of the switch are susceptible to deterioration over time and can prevent switch operation and ELT activation.

TSB Final Report A07C0148—Collision with Power Line Tower

On August 9, 2007, a Bell 206L-3 helicopter was transporting a lineman to Tower 63 on the Sheridan power line near Cranberry Portage, Man. While hovering near the tower, the helicopter's skid gear became entangled in the uppermost cablespan. The helicopter struck the tower and crashed on the adjacent power line right-of-way. The helicopter was substantially damaged by impact forces and fire; the pilot and passenger both sustained fatal injuries. The accident occurred during daylight hours at 09:03 Central Daylight Time (CDT).

Analysis

The damage to the helicopter engine and rotor assemblies indicates that the damage was sustained while the drive-train was operating under power. The damage to the skid gear and tower structure was consistent with flailing damage sustained from an uncontrollable state of rotation after the helicopter became entangled in the cable and tower structure.

The nature of the damage to the skid gear attachment point indicates that the helicopter was hovering when it became entangled in the tower structure. The reason the helicopter was hovering so close to the tower was not determined.

The VFR weather conditions that existed at the time of the occurrence (visibility 15 mi. and a ceiling of 1 500 ft, overcast with the possibility of light rain) would not have affected the pilot's perception of his position or complicated the task of hovering near the tower.

The passenger's injuries and the location of his body indicated that he fell from or was ejected from the helicopter during the accident sequence. The reason for the fall or ejection was not determined.

Although there are hazards specific to helicopter operations near power lines, Manitoba Hydro did not have an audit process to ensure that safety standards and quality of services provided by contract aviation services were met. Such an audit procedure could have helped identify the need for specialized training to reduce risks in operations near power lines.

The operator did not offer or require its pilots to take any specialized training to identify and reduce exposure to power line hazards. It also had no procedure for line pilots to report hazardous operating conditions. Such programs could have reduced the risks associated with helicopter power line operations.

Finding as to causes and contributing factors

1. The helicopter was hovering close to the power line tower structure and became entangled in the upper (non-energized) cable span. As a result, the helicopter became uncontrollable, collided with the tower structure, and crashed.

Finding as to risk

1. The operator did not have training procedures specific to helicopter operations in the vicinity of power lines and did not have a procedure for reporting hazardous operating conditions. Such programs could have reduced the risks associated with helicopter power line operations.

Other finding

1. Manitoba Hydro did not have an audit procedure in place that might have identified the need for specialized training for helicopter operations specific to their contract requirements.

Safety action taken

In response to information revealed during the investigation, Manitoba Hydro has taken the following safety action:

- Manitoba Hydro forwarded "other finding" number 1 to its internal audit department in February 2008 for review and implementation.
- Manitoba Hydro has undertaken to write and implement a "safe work procedure standard" for employees and pilots conducting power line inspections.

TSB Final Report A07O0233—Loss of Control and Impact with Runway

On August 18, 2007, a single-seat Pezetel SZD-51-1 Junior glider was on a routine local flight from the Rockton, Ont., airport with a student pilot on board. The flight was scheduled to last approximately one hour. At the end of the hour, the duty instructor at the club attempted to contact the pilot via radio, but there was no response. Shortly thereafter, the glider was seen entering the circuit and was observed on final approach to Runway 18/36. As it flew over the road near the end of the runway, the air brakes were partially deployed and then retracted. As it continued over the runway at a height of approximately 25 ft above ground level (AGL), the air brakes were fully deployed and the glider pitched nose-down approximately 45° and struck the ground. The cockpit was substantially damaged by the ground impact and the student pilot sustained fatal injuries.

Analysis

The pilot had been trained on and flown in other glider types owned by the gliding club. Most of the flying experience was in dual-seat trainers, which were flown both with an instructor and solo. Solo flights are monitored by an instructor on the ground via radio communication. For undetermined reasons, the instructor was not able to establish radio contact with the pilot at the expected return time.

The examination of the glider revealed no pre-impact mechanical failures. The weather was not a factor and the pilot had been trained to perform the solo flight. Unusual flight behaviour was first observed during the final approach to the runway. At the altitude the glider started the final approach, the air brakes would normally be extended to reduce altitude. No air brake deployment was observed. As a consequence, the aircraft speed and altitude were high for this stage of the approach. The first aircraft pitch-down was coincident with the air brake deployment.

The significant pitch-down attitude that followed suggests that the pilot was aware that the glider was high on the approach and was attempting to lose altitude for a successful approach and landing. The ensuing pitch oscillations were a result of overcorrecting by excessive stick inputs to try and arrest the rapid descent. Although the pilot stabilized the oscillations, the glider remained high, and due to the steep descent, it gained airspeed.

The pilot may have been hesitant to apply air brakes to correct the situation because of the previous pitch control issues. Consequently, the glider was now in a long-landing situation. As the landing distance available decreased, the pilot needed to deploy the air brakes in order to land on the remaining runway. Sensing the urgency to land the glider, the pilot may have applied forward stick coincident with air brake deployment. The final pitch-down into the runway may have been a result of these two actions.

Findings as to causes and contributing factors

1. The pilot may not have been familiar with the flight characteristics of the glider because this was the first

flight on type. The glider was flown high and fast on approach.

2. The resultant long-landing situation may have caused the pilot to utilize air brakes and forward stick input to land the glider on the remaining runway. The final pitch-down into the runway may have been a result of these two actions.

TSB Final Report A07O0238—Collision with Terrain in Deteriorating Weather

On August 28, 2007, a Bell 206L-1 helicopter was being operated from a remote area located approximately 100 NM east of Webequie, Ont., and was destined for Cochrane, Ont. The flight departed under visual metrological conditions (VMC); however, deteriorating weather conditions were encountered en route. At approximately 21:00 Eastern Daylight Time (EDT) and five miles west of Cochrane, the pilot lost outside visual reference and the aircraft struck the ground. The aircraft was on a flight plan and therefore a communication search was started by the London flight information centre (FIC). Personnel from the operator began a ground search and located the aircraft approximately three hours after the occurrence. The aircraft was destroyed and the pilot, who was the only occupant, was seriously injured.

Other factual information

On the day of the occurrence, the pilot received a weather briefing from the London FIC for the series of flights planned for that day. The aerodrome forecast (TAF) for the Timmins, Ont., area indicated VMC. The forecast, however, was only valid until 16:00 EDT. Another TAF was expected to be issued at 10:00 EDT.

A VFR flight plan was filed for the flight to a remote location referred to as Tango 1 (T1) and for the return leg to Cochrane. The pilot departed the company's facility in Cochrane at 09:45 EDT.

At 17:35 EDT, a satellite telephone was used at T1 to update the VFR flight plan on file with the London FIC; however, no weather information was requested. There was no contact made with the company base in Cochrane to determine the local weather conditions.

The aircraft departed T1 for Cochrane at approximately 18:00 EDT. Approximately 60 NM northwest of Cochrane, the ceiling deteriorated to about 300 ft above ground level (AGL).

The weather continued to deteriorate and eventually the pilot was flying at near treetop level and navigating by following a river that headed towards Cochrane. As the aircraft approached its destination, there was a relatively small area of improved visibility and ceiling in the general direction of Cochrane. The pilot subsequently abandoned the river navigation and attempted to fly towards Cochrane; however, visual reference to the ground was lost due to the poor weather conditions.

The aircraft struck the ground while flying in an easterly direction and travelled through the brush upright for approximately 108 ft before becoming airborne again for a short distance. It then struck the terrain in a nose-down attitude, flipped over and came to rest on its left side. The total wreckage trail was 418 ft. The entire cockpit forward of the pilot's seat was destroyed.

Analysis

The pilot did not obtain any weather update before his departure from T1. He would not, therefore, have been aware that conditions at destination had been deteriorating throughout the day and that the latest forecast was calling for conditions below limits for VFR operations. Furthermore, the destination co-ordinates were not used for the time of sunset calculations, resulting in a 22-min error. This resulted in an arrival in the Cochrane area after sunset, with poor weather conditions present.

The pilot received the minimum instrument training required for the issuance of a commercial helicopter licence. Four years had elapsed between the time the pilot had taken this instrument training and the date of the occurrence. If not practiced, instrument flying skills deteriorate over time. In addition, because of the malfunction of the directional gyro, the pilot referenced the GPS for primary heading information. This most likely hampered the proper scan of the primary flight instruments. These two factors likely contributed to the pilot's difficulty in flying the aircraft with reference to instruments only.

The above-mentioned instrument training is deemed sufficient to allow non-instrument-rated pilots to maintain control of the aircraft in case of inadvertent flight into instrument meteorological conditions (IMC). The pilot can then fly to an area of improving weather. However, in this instance, the weather at destination had deteriorated significantly. Returning to a previous location along the route of flight was likely discounted because it was dark and the pilot did not have a night rating or any experience flying at night. The pilot attempted to fly on instruments but became disoriented and the aircraft was inadvertently flown into the ground.

Finding as to causes and contributing factors

1. The flight was continued at night in deteriorating weather conditions resulting in the pilot losing visual reference with the ground and becoming disoriented, which resulted in the aircraft being flown into the ground.

Findings as to risk

1. Departing without the latest available weather increases the possibility of inadvertent flight into inclement weather.
2. Mounting the emergency locator transmitter (ELT) in the area of the lower nose window made it vulnerable to impact damage. As a result, the ELT became detached and was separated from its external antenna during the impact sequence, increasing the risk of the ELT signal not being detected.

Safety action taken

The operator issued an operational notice to all its pilots concerning human factors, pilot decision making and standard operating procedures, with emphasis on VFR weather minima. The company also provided recommendations on how to conduct cross-country flights.

The company will continue developing and implementing the safety management systems (SMS) approach, including the addition of more Transport Canada training aids, safety reports concerning human factors and causes of occurrences. The company has completed a pilot survey regarding company safety culture; the results will be analyzed and used for future safety purposes.

The operator has also implemented a satellite tracking system on all of its aircraft. As a result, the location of its entire fleet can be monitored from its main facility in Cochrane, Ont.

TSB Final Report A08Q0187—VFR Flight into Adverse Weather and Forced Landing

On September 23, 2008, a float-equipped DHC-2 Mk 1 aircraft with the pilot and one passenger on board, was on a VFR flight from Sainte-Véronique, Que., to an outfitting operation on Lac César, Que. When the aircraft was about 30 NM from the destination, the weather deteriorated. After a few minutes, the pilot could neither continue the flight nor reverse course. For several minutes, the pilot tried to find a safe spot for a water landing, without success. He then decided to set the aircraft down in the trees. The two occupants were wearing their seatbelts, were not injured, and had no difficulty evacuating the aircraft. The aircraft sustained substantial damage. The occurrence happened at approximately 15:30 Eastern Daylight Time (EDT).

Analysis

The pilot was qualified for the flight. There was no pressure on him to return to Lac César, particularly because the flight would generate no revenue. The aircraft had no known deficiencies and was maintained in good condition for flight.

The pilot checked the local weather with the Lac César camp before departing Sainte-Véronique. According to the camp employee, the flying conditions were suitable for the return flight. The pilot did not request a weather briefing from the flight information centre (FIC), nor was he in the habit of doing so. In any event, even if he had checked with the FIC, there was nothing in the forecast to suggest that the weather would be such as he encountered en route. The pilot's decision to make the flight was justified. When the conditions deteriorated en route, he delayed making a decision as to whether to turn back or land. It is possible that being close to his destination and being very familiar with the area influenced his decision to continue the flight until he had exhausted all options.

The pilot decided to set the emergency locator transmitter (ELT) to "ON" even though he had decided to leave the site. This decision may have had adverse consequences if one of the accident aircraft occupants was injured while walking, especially considering that there was no means of communication available to them. As well, with the main reason for activating an ELT being to save lives, the search and rescue (SAR) team was deployed in adverse weather, needlessly putting them at risk.

It was not unusual for aircraft to not arrive at the destination at the expected time. Consequently, the employee at Lac César was not overly concerned. She

did not know that the pilot was unable to contact her and inform her of the occurrence because he had not brought his satellite phone with him on this trip. The call received that evening from Lac Gilberte, which became disconnected, gave reason to believe that the flight had diverted due to weather and had landed safely. However, knowing that the aircraft had departed Sainte-Véronique, that it was past its expected arrival time, and that no call had been received to explain why it was late, the emergency plan should have been activated automatically in accordance with the procedure set out in the company operations manual. Not having activated the company emergency plan could have led to grave consequences if the occupants had been seriously injured in this accident.

Finding as to causes and contributing factors

1. The pilot delayed making a decision as to whether to turn back or land when he saw that the weather was deteriorating. Being close to his destination and being very familiar with the area probably influenced his decision to continue the flight until he had exhausted all options.

Findings as to risk

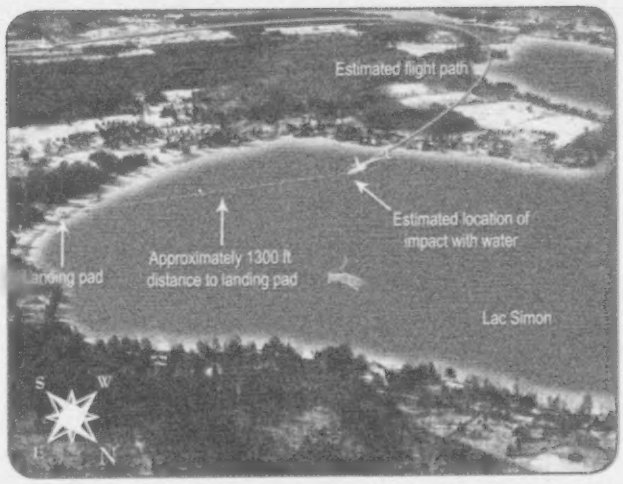
1. Although the main reason for activating an ELT is to save lives, the pilot decided to depart the site and leave the ELT set to "ON". As a result, the SAR team was deployed in unfavourable weather conditions, needlessly putting them at risk.
2. Not having activated the company emergency plan could have led to grave consequences if the occupants of the downed aircraft had been seriously injured.

Other finding

1. There was nothing in the forecast to suggest that the weather would be as the pilot encountered en route. The pilot's decision to make the flight was therefore justified.

TSB Final Report A08Q0231—Controlled Flight Into Water

On December 3, 2008, at approximately 17:21 Eastern Standard Time (EST), a privately operated Robinson R44 Raven I helicopter departed Sainte-Anne-des-Plaines, Que., with the pilot/owner and three passengers on board for a night VFR flight to the pilot's cottage located at Lac Simon, Que. The 52-NM trip was uneventful. To establish the helicopter on approach to the lit landing pad positioned in front of the cottage, the pilot turned right onto final approach at an altitude of approximately 150 ft above the lake. On final approach, the helicopter continued the descent and struck the water. All occupants escaped uninjured. One passenger successfully swam approximately 1 000 ft to shore, while another was rescued by two persons in a rowboat. The pilot and one passenger were unable to reach the shore and drowned. The helicopter sank in 25 ft of water and was substantially damaged. The occurrence took place at approximately 18:05 EST under dark, night conditions.



Estimated Robinson R44 flight path before impact with water

Analysis

Visual cues in the environment, such as trees, buildings, objects, terrain textures, and features, plus a cross-check with the flight instruments are necessary for a pilot to adequately assess a helicopter's speed, attitude, altitude, rate of descent, and rate of closure. The lack of visual cues inherent at night in poorly lit areas can make night flying, takeoffs, and landings challenging.

While the weather conditions were appropriate for VFR flight at night, the dark lighting conditions of the surrounding area and the approach over the dark surface of the lake provided ideal conditions for the black hole illusion. It is likely that as a result of this illusion, the pilot believed the helicopter was higher than it was during the approach to land. The pilot unknowingly flew the helicopter lower than the intended approach path, causing the helicopter to collide with the surface of the water well before reaching the desired landing area.

The minimum requirements necessary to obtain a private helicopter pilot night rating may not be sufficient to adequately educate and demonstrate to private helicopter pilots the risks involved in night flying, including visual illusions. Present night rating requirements are the same for private helicopter pilots as for private fixed-wing pilots, yet the environments in which they may operate at night can vary greatly.

Flying over the lake on approach at night ensures a helicopter is away from obstacles and allows for a shallower approach to land. However, in the event of an

unforeseen problem, the helicopter may not be within gliding distance from the shore, thereby posing a risk to the aircraft and its occupants. It is unlikely that the missing persons would have survived more than a few minutes given the cold water temperatures.

Current regulations do not specify light intensity, colour, number of lights, or approach path aids for private helicopter landing pads. The three (of four) low-intensity, solar-powered LED lights on the corners of the landing pad and the bonfire in front of the landing area would not have illuminated the surrounding area sufficiently to help the pilot judge a safe and constant approach angle over the dark, featureless surface of the water.

Findings as to causes and contributing factors

1. It is likely that the effect of the black hole illusion caused the pilot, in full control of the aircraft, to unknowingly fly the helicopter lower than the intended approach path, causing the helicopter to collide with the surface of the water well before reaching the desired landing area.
2. The helicopter approached the landing pad over water and, after colliding with the lake surface, the occupants had to evacuate in near-freezing water temperature, exposing them to hypothermia.

Findings as to risk

1. The minimum requirements necessary to obtain a private helicopter pilot night rating may not be sufficient to adequately educate and demonstrate to private helicopter pilots the risks involved in night flying, including visual illusions.
2. Current regulations do not specify light intensity, colour, number of lights, or approach path aids for private helicopter landing pads, thereby increasing the risk of accidents or incidents in degraded environmental conditions. △

ACCIDENT SYNOPSES

Note: The following accident synopses are Transportation Safety Board of Canada (TSB) Class 5 events, which occurred between February 1, 2010, and April 30, 2010. These occurrences do not meet the criteria of classes 1 through 4, and are recorded by the TSB for possible safety analysis, statistical reporting, or archival purposes. The narratives may have been updated by the TSB since publication. For more information on any individual event, please contact the TSB.

— On February 6, 2010, a privately registered Stinson 108-2 had departed from the ice surface of Lake Winnipeg, near the mouth of the Manigatogan River, for a VFR flight with a pilot and one passenger to Lyncrest airport near Winnipeg, Man. Shortly after takeoff, the pilot noted that the visibility had deteriorated, and attempted to return to his departure point. During the turn, the pilot encountered whiteout conditions and was unable to maintain visual reference to the ground. The aircraft descended and collided with the ice surface approximately 4 NM southwest of the Manigatogan River. The pilot sustained minor injuries and the passenger sustained serious injuries. The aircraft sustained substantial damage from the impact, and was later destroyed when the pilot lit the wreckage to attract rescue personnel. The emergency locator transmitter (ELT) was damaged in the fire. *TSB File A10C0017.*

— On February 8, 2010, a Piper PA-44-180 Seminole with an instructor and two students on board was conducting single-engine approaches to the Toronto/Markham, Ont., airport. During the occurrence approach, the student was having difficulty with the approach and the pilots forgot to lower the landing gear. The aircraft touched down with the gear retracted and was substantially damaged. There were no injuries. *TSB File A10O0025.*

— On February 21, 2010, an amateur-built Super Ben 160 took off from a field around 5 mi. west of Chicoutimi, Que., for a local flight in VFR conditions. During takeoff, the aircraft was pushed out to the right by a crosswind. The right wing hit a tree and the aircraft pivoted and went into a ditch. The pilot was not injured. The emergency locator transmitter (ELT) was triggered on impact and was immediately turned off by the pilot. The aircraft sustained damage to the wings, the propeller, the engine cowl, and the engine. *TSB File A10Q0020.*

— On February 21, 2010, an RS Ultra Kangook B powered parachute was flying above the Saint-Charles-Borromée Park in the Joliette, Que., area when the pilot lost control of the aircraft and crashed upon landing. The aircraft sustained major damage. The pilot sustained minor injuries. *TSB File A10Q0022.*

— On March 4, 2010, a wheel- and ski-equipped de Havilland DHC-3T Turbo Otter was landing at Webequie, Ont. Immediately after touchdown, the aircraft nosed over, striking the propeller and damaging the engine (Pratt & Whitney PT6A-35). The aircraft settled back on its wheels and remained upright. Information provided indicated that the brakes were frozen. *TSB File A10C0026.*

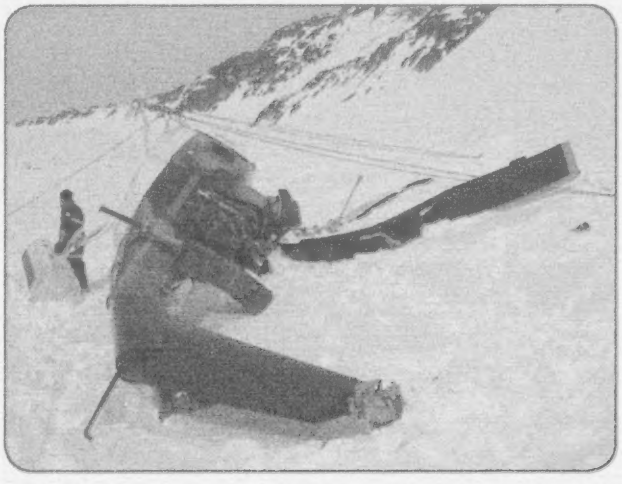
— On March 7, 2010, the pilot of a Cessna 172 was conducting a low-altitude waterfowl survey with two passengers on board, approximately 14 NM east of Yarmouth, N.S. While conducting the survey, the engine (Lycoming O-320-B2D) lost power. The pilot then elected to conduct a forced landing on a paved road. The aircraft contacted a telephone line just prior to touchdown with approximately 600 ft of road remaining. The aircraft veered toward the right, and the right wing struck a stop sign. The aircraft continued forward, crossing a ditch and striking a tree before coming to rest. The pilot and the two passengers were seriously injured. The aircraft was substantially damaged. *TSB File A10A0025.*

— On March 7, 2010, a Hiller UH-12E helicopter was conducting tree cone harvesting approximately 10 NM north of Hythe, Alta., when on an approach the tail rotor struck branches. An attempt was made to pull up; however, this led to an over-torque condition and the helicopter fell to the ground in forested terrain. The pilot was the lone occupant and was not injured. *TSB File A10W0044.*

— On March 9, 2010, a ski-equipped PA11 Piper was preparing for a private flight in the Gatineau, Que., area. The aircraft was parked at the edge of a lake. The mooring lines were not attached. Since the aircraft did not have an electrical system, the engine was started using the propeller. A second pilot started the engine while the pilot who owned the aircraft was at the controls. The two pilots let the engine warm up, standing away from the prop wash behind the right wing. After a few minutes, under the combined effect of the prop wash and the slight slope of the shoreline, the aircraft began to slide toward the lake. Concerned with the situation, the pilot who was not the owner ran to the cockpit with the intention of stopping the engine. He was unaware that the aircraft did not have a mixture control with idle cut-off, and that the engine needed to be shut off by cutting the magneto ignition. It seems that the pilot's clothing accidentally moved the gas control on the left wall of the cockpit. The engine accelerated, the aircraft climbed over a snowbank and did a semi-circle on the lake, hitting trees along the shoreline. The pilot on board was not injured. The aircraft sustained major damage. *TSB File A10Q0029.*

— On March 16, 2010, the pilot of the Beaver RX 550 basic ultralight took off on skis from Lac Paré, Que., for a local flight. The aircraft experienced downdraughts during the initial climb. It hit some spruce trees then crashed into the roof of a house. The passenger was not injured, but the pilot sustained chest injuries. Firefighters removed the aircraft from the roof since fuel was leaking from the aircraft. Two rafters and the roof covering were damaged. The aircraft sustained major damage. *TSB File A10Q0032.*

— On March 22, 2010, a Bell 212 helicopter engaged in heli-skiing operations reportedly encountered whiteout conditions while attempting to land in mountainous terrain to drop off skiers 20 mi. west of White Saddle Ranch, near Alexis Creek, B.C. The aircraft drifted away from the landing site, the main rotor blade struck a snow-covered slope and the helicopter rolled onto its right side. The pilot sustained minor injuries. The ten passengers were not injured. *TSB File A10P0073.*



The operator took extensive follow-up action and found it had all the best "hard" safety measures in place, such as standards, SOPs and competency-based training. Therefore, it focused on the human factors side of things in order to prevent a recurrence.

— On March 27, 2010, the pilot of a Cessna 210B was preparing to depart on a cross-country flight and decided to fly a circuit before loading his passengers. When he extended the gear during the circuit, the nose gear failed to extend. After attempting a manual extension, the pilot recycled the gear a couple of times with the same result. He then phoned his maintenance facility and received suggestions on other sequences to try, but the nose gear did not extend. After circling the airport for about 3 hr

to reduce the fuel load, the aircraft landed with the main gear extended and the nose gear retracted. The pilot was uninjured, but the aircraft sustained damage to the propeller, engine, nose gear doors, lower cowl, and lower forward fuselage. Maintenance lifted the forward fuselage, pried open the doors, and manually released the nose gear uplock. The gear extended normally and locked down. Further tests were planned to try to duplicate the uplock malfunction. *TSB File A10W0046.*

— On March 28, 2010, a Cessna 172M left Prince George, B.C., for a dual cross-country flight via Quesnel and Barkerville, back to Prince George. After a touch-and-go landing at Quesnel, the aircraft continued to Barkerville. When overhead Barkerville, the student and instructor visually inspected the snow-covered runway and made a low pass. The snow surface appeared to be compact and the instructor decided to allow the student to land. The aircraft landed on Runway 11, but during the landing roll the wheels dug into the snow and the aircraft overturned. The aircraft was substantially damaged but the two pilots were not injured. *TSB File A10P0082.*

— On April 5, 2010, an ATR-42 was landing at Pangnirtung, Nun., in good weather conditions. The aircraft landed firmly and bounced once. After the flight, the crew inspected the aircraft and noticed cosmetic damages to the COMM2 antenna. After the following flight to the maintenance base in Iqaluit, substantial structural damages to the tail section were found, requiring repairs before the next flight. *TSB File A10Q0039.*

— On April 14, 2010, a Cessna 172 was conducting a VFR training flight with a student-pilot on board. The pilot lost control of the aircraft during the landing roll on Runway 03 at Sorel, Que. The aircraft exited the runway on the left and came to rest, nose down, in a drainage ditch. The pilot was not injured in the accident. *TSB File A10Q0043.*

— On April 16, 2010, a Bell 206LR helicopter was on a re-positioning flight from Yellowknife, N.W.T., to Whitehorse, Y.T. After departure from Watson Lake, Y.T., the aircraft was crossing a ridge at approximately 5 000 ft above sea level (ASL) when a decision was made to land on top of a mountain. After determining the wind direction, the pilot approached the landing area into the wind. On short final, the helicopter entered an unanticipated yaw to the right. The aircraft landed hard and rolled onto its left side. The aircraft sustained substantial damage. The pilot and two passengers were uninjured. *TSB File A10W0054.*

— On April 18, 2010, a Cessna 185 on amphibious landing gear was taking off on Runway 14 at Salmon Arm, B.C., for a local flight. During the take-off roll, the pilot perceived that the engine performance was below par. He noted 25 in. of manifold pressure and decided to abandon the takeoff when the aircraft had used about two-thirds of the runway. The aircraft overran the end of the runway, struck an embankment between two ditches running at right angles to the runway, and overturned. The aircraft was substantially damaged. The four occupants sustained minor injuries. *TSB File A10P0096.*

— On April 23, 2010, the amateur-built Diamant was about to take off from St-Tite, Que., for a flight to the Trois-Rivières, Que., airport, with the pilot and one passenger on board. After giving full throttle for takeoff, the pilot's seat slid backward. The pilot was no longer able to press the rudder pedals and lost control of the aircraft. The aircraft veered to the right, went off the runway and stopped after hitting a tree. The occupants were not injured in the accident. The aircraft's wings sustained major damage. The pilot's seat was not properly fitted to the track after being lubricated. *TSB File A10Q0048.*

— On April 30, 2010, a privately registered Bellanca 8GCBC (Scout) was attempting to land northbound on a private field near Comox, B.C., when control was lost. The aircraft went through a fence and impacted a power pole. The left wing was torn off and the aircraft came to rest inverted in a drainage ditch. The pilot and passenger were wearing five-point harnesses and reported no injuries. *TSB File A10P0108.* △

Flying Farmers—Who Falls Within the Definition of a "Farmer" and When Does the Concept of "Hire or Reward" Apply? ..... page 34
Oral Counselling ..... page 35

Flying Farmers—Who Falls Within the Definition of a "Farmer" and When Does the Concept of "Hire or Reward" Apply?

by Beverlie Caminsky, Chief, Advisory and Appeals, Policy and Regulatory Services, Civil Aviation, Transport Canada.

In this issue, the Advisory and Appeals Division wishes to share two cases. Case No. 1 discusses the question of determining when a company falls within the definition of a "farmer," as set out in section 700.01 of the *Canadian Aviation Regulations* (CARs). Case No. 2 discusses the question of "hire or reward."

Pursuant to section 700.01 of the CARs:

> *"Farmer" means a person whose primary source of income is derived from the tillage of the soil, the raising of livestock or poultry, dairy farming, the growing of grain, fruit, vegetables or tobacco, or any other operation of a similar manner.*

In Case No. 1, a commercial aerial applicator used an airplane to conduct aerial work for agricultural purposes, which involved the dispersal of products or spraying for various farmers. The Minister of Transport assessed a monetary penalty for the contraventions. More specifically, the company was charged with operating without an air operator certificate (AOC) and with failure to make entries in their journey log for flights over a three-month period. There were 44 counts assessed at $5,000 per count for contraventions of section 700.02 of the CARs and one count for a contravention of section 605.94 of the CARs. The fine assessed for this last contravention was $7,500. The total fine assessed against the company was $227,500.

In Case No. 2, the pilot-in command (PIC)—and sole shareholder of the company from Case No. 1—was assessed a monetary penalty of $5,000 for contravening subsection 401.03(1) of the CARs. Specifically, it was alleged that the PIC acted for "hire or reward" when he did not hold a commercial pilot licence.

The company and the PIC both asked the Transportation Appeal Tribunal of Canada (TATC) to hold a hearing to review the Minister's decision to assess the penalties.

With respect to Case No. 1, the company would have had a defence to the charges of operating without an AOC if it had met the definition of "farmer" under section 700.01 of the CARs (cited above). The company would have had to have owned the aircraft used for spraying, and

the spraying would have had to have taken place within 25 miles of the centre of the company's farm, as set out in subsection 700.02(3) of the CARs.

If the company had met the above requirements, it would not have needed an AOC. The company did not, however, meet the definition of farmer, as its primary source of income was not derived from farming, but rather from crop spraying. In addition, the pilot owned the aircraft and the spraying operations took place outside the 25-mile radius of the farm. The evidence revealed that the pilot's wife owned the farm.

In addition, the failure to maintain an up-to-date logbook was proved and the TATC review member upheld the Minister's assessment of $7,500 against the company.

In Case No. 2, against the PIC, evidence was put forward that the PIC held a private pilot licence but did not hold a commercial pilot licence. With respect to the questions of whether the PIC was operating for "hire or reward," evidence was put forward that he was registered as a flying farmer in the provincial Aerial Applicators' Association member directory. Evidence was also put on the record that various clients made payments to the company in Case No. 1 for the aerial work ($74,027.25). The PIC was the sole shareholder of that company.

Subsection 3(1) of the *Aeronautics Act* defines "commercial air service" as "any use of aircraft for hire or reward" and defines "hire or reward" as "any payment, consideration,

gratuity or benefit, directly or indirectly charged, demanded, received or collected by any person for use of an aircraft".

The TATC review member determined that the pilot acted for "hire or reward" in Case No. 2. He cited a TATC appeal decision where the appeal panel determined that Company A, owner and operator of an aircraft used for commercial air service, had contravened the CARs. This determination was made even though Company B, which shared some of the same directors as Company A, demanded and received payments for the commercial flights. No proof was made that any funds flowed from Company B to Company A. The appeal panel held that, although there was no direct benefit to Company A, to suggest that Company A operated its aircraft and received no benefit was not believable. Therefore, it was determined that Company A had received an indirect benefit, bringing it within the purview of the definition of "hire or reward."

Similar to the appeal panel's decision discussed in the paragraph above, the TATC review member determined that to suggest that the PIC piloted his own aircraft for the benefit of the company in Case No. 1—a corporation for which he is the sole shareholder—without receiving some type of benefit is simply not believable.

The cases discussed above provide us with useful information on what the definition of "farmer" is and on when a pilot can be found to have operated for "hire or reward." △

Oral Counselling

by Jean-François Mathieu, LL.B, Chief, Aviation Enforcement, Standards, Civil Aviation, Transport Canada

The most important decision in the enforcement process is determining which deterrent action would be most appropriate when evidence indicates that a person has contravened a provision of the *Aeronautics Act* or the *Canadian Aviation Regulations* (CARs). This decision may significantly affect the offender's attitude towards safety and future compliance.

Contraventions of aeronautics legislation can result in a wide range of penalties, including fines, suspensions or cancellations of Canadian aviation documents, and even imprisonment in severe cases.

The major objectives of deterrent action are to:

(1) encourage future compliance by the offender; and,
(2) deter others from contravening aeronautics legislation.

Achieving these objectives will contribute to the advancement of aviation safety, which is the Aviation Enforcement Division's primary aim.

Another option available to Aviation Enforcement inspectors is "oral counselling." This option may be used when the contravention is considered minor in nature or inadvertent; is a violation where there is no direct flight safety hazard; or when the imposition of a sanction would not be appropriate. Aviation Enforcement inspectors will assess all aspects of the contravention, including the attitude of the alleged offender, to determine whether oral counselling will promote future compliance.

In the last year, "oral counselling" was assessed in 43 percent of all cases where there was a violation. The Aviation Enforcement Division recognizes that voluntary compliance with Canadian aeronautics legislation is the most progressive and effective approach to aviation safety. Voluntary compliance is based on the idea that members of the aviation community have a shared interest in, commitment to, and responsibility for aviation safety, and will operate on the basis of common sense, personal responsibility, and respect for others. Aviation Enforcement inspectors use oral counselling with this philosophy in mind.

Oral counselling is most appropriate in cases of ignorance or misinterpretation of the law, provided aviation safety was not jeopardized. Examples include situations where a minor contravention is committed and it had little or no impact on safety, and where there was no indication of a wilful act. Oral counselling is not an option when the alleged offender disputes the allegations.

It should be noted that when Aviation Enforcement inspectors conduct comprehensive investigations that are concluded with oral counselling, no Aviation Enforcement record is kept in the offender's file.

Canada continues to play a leadership role in the international aviation safety community and within our national borders. In supporting this role, the Aviation Enforcement Division is committed to promoting and applying a policy of fairness and firmness when dealing with contraventions of aeronautics legislation.

Have a safe and enjoyable flight! △

Déja vu: The Importance of the Underwater-Egress Pre-Flight Briefing for Passengers

This article is a condensed version of The Importance of the Underwater-Egress Pre-Flight Briefing for Passengers, *by Jackie Heiler of Pro Aviation Safety Training, and originally published in* Aviation Safety Letter *(ASL) 2/2009. We feel it is worth repeating the value of underwater egress training and proper pre-flight passenger briefings, as part of our continued efforts to promote floatplane safety. —Ed.*

In recent years, Transport Canada and the specialized underwater-egress training industry have made considerable efforts in educating pilots and operators on the importance of underwater-egress procedures and training. Through pamphlets, newsletter articles, posters, videos and brochures, the aviation industry has received the bulk of the information and awareness materials. However, those education efforts have succeeded only partially; while our crews and operators are aware and ready, a very important segment of our industry—the passengers—has not benefited to the same extent from this awareness drive.

Most passengers will not seek specialized underwater-egress training, and therein lies the challenge. It is therefore the commercial operators—and their flight crews—who are in the best position to transfer this knowledge to them. The most effective and traditional way of accomplishing this is to provide the best, most comprehensive pre-flight briefing possible—supported by a pre-flight video and reading material, such as a brochure or pamphlet.

For passengers, the most difficult part of surviving a ditching accident is the underwater egress. Accident reports indicate that many people survive the initial impact, but needlessly drown because they were unable to extricate themselves from the aircraft. A study by the Transportation Safety Board of Canada (TSB) suggested that fatalities in seaplane accidents terminating in water are frequently the result of post-impact drowning. Most drownings occurred inside the cabin of the aircraft, and occupants who survived often found exiting the aircraft quite difficult. In fact, over two-thirds of the deaths occurred to occupants who were not incapacitated during the impact, but drowned trying to escape the aircraft.

Why do passengers encounter difficulties when trying to get out of an aircraft that has submerged? Panic, disorientation, unfamiliarity with escape hatches, and lack of proper training are some of the major factors that contribute to passenger drowning. During an emergency situation, rather than pausing to think, most will react on instinct and as a result of learned behaviours; if people never acquired a learned behaviour that is appropriate for this type of situation—such as the steps to follow in an

Typical underwater-egress training exercise, professionally supervised and done with portable equipment in local pools.

underwater-egress scenario—then the odds of reacting appropriately are much smaller. For example, when getting out of a car, most of us release our seat belt before opening the door. We do this without even thinking: it is a learned behaviour. If we are strapped into an aircraft that is sinking, a common reaction is to release our seat belt first, then try to get out. We have reverted to the learned behaviour we have acquired every time we get out of a car.

In many accidents, people have hastily and prematurely removed their seat belts and, as a result, have been moved around the inside of the aircraft due to the in-rushing water. With the lack of gravitational reference, disorientation can rapidly overwhelm a person. The end result is panic and the inability to carry out a simple procedure to find a way out of the aircraft.

An unfamiliar task, to be executed submerged, quite possibly upside down, in the dark, and in very cold water: what could seem like a simple undertaking suddenly becomes monumental. To help prevent panic and disorientation, we recommend that you brief passengers thoroughly before each flight on the steps of underwater egress described in the brochure entitled *Seaplane/ Floatplane: A Passenger's Guide* (TP12365), available on our new floatplane Web site at www.tc.gc.ca/floatplanes. A thorough pre-flight briefing can make the difference between life and death for your passengers. △

2010 Flight Crew Recency Requirements
Self-Paced Study Program

Refer to paragraph 421.05(2)(d) *of the* Canadian Aviation Regulations *(CARs).*

This questionnaire is for use from November 1, 2010, to October 31, 2011. Completion of this questionnaire satisfies the 24-month recurrent training program requirements of CAR 401.05(2)(a). *It is to be retained by the pilot.*

All pilots are to answer questions 1 to 30. In addition, balloon pilots are to answer questions 31 and 32; glider pilots are to answer questions 33 and 34; aeroplane and ultralight aeroplane pilots are to answer questions 35 and 36; helicopter pilots are to answer questions 37 and 38; and gyroplane pilots are to answer questions 39 and 40.

Note: Many answers may be found in the Transport Canada Aeronautical Information Manual *(TC AIM). TC AIM references are at the end of each question. Amendments to this publication may result in changes to answers and/or references. The TC AIM is available on-line at:* www.tc.gc.ca/eng/civilaviation/publications/tp14371-menu-3092.htm

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1. When used in the text of a NOTAM, the date-time group is composed of ten figures, e.g. 1001191200. The first two digits indicate the _____; the second two, the _____; the third two, the _____; and the last four, the _____. (GEN 1.6.1)
2. Using the chart in GEN 1.6.2, find the end of evening civil twilight at Medicine Hat, Alta., (50°N 110°45'W) on May 29. _____ . (GEN 1.6.2)
3. No person shall displace, move or interfere with an aircraft involved in an accident, or disrupt an occurrence site without first having obtained permission from investigators, except to _____, to _____ _____, or to _____. (GEN 3.4.1)
4. Except in the case of an emergency, what must a pilot do prior to using an aerodrome with PPR or PNR listed in the *Canada Flight Supplement* (CFS) or *Water Aerodrome Supplement* (WAS)?
   PPR: _____
   PNR: _____. (AGA 2.2)
5. What VHF direction-finding (VDF) services are available from stations offering VDF?
   _____. (COM 3.10)
6. Is a VFR GPS receiver with a current database acceptable as a replacement for aeronautical charts? _____. (COM 3.16.16)
7. What information should be included on initial contact with a remote communications outlet (RCO)?
   _____. (COM 5.8.3)
8. In Southern Domestic Airspace (SDA) the correct frequency for two aircraft to use for air-to-air communication is _____MHz. (COM 5.13.3)
9. Cloud-base heights in aviation routine weather reports (METAR) and aerodrome forecasts (TAF) are always stated as height _____. On the other hand, heights in graphic area forecasts (GFA) and pilot weather reports (PIREP) are normally stated as height _____. (MET 1.1.5)
10. What does the following represent in a GFA? SCT $\frac{50}{30}$
    _____. (MET 3.3.11)

TAF CYXE 281139Z 2812/2912 24010G25KT WS011/ 27050KT 3SM –SN BKN010
OVC040 TEMPO 2818/2901 1 1/2SM –SN BLSN BKN008
PROB30 2820/2822 1/2SM SN VV005
FM290130Z 28010KT 5SM –SN BKN020
BECMG 2906/2908 00000KT P6SM SKC
RMK NXT FCST BY 281800Z

11. What is the period covered by the above forecast? _____. (MET 3.9.3)
12. Describe the wind shear in the above forecast. _____. (MET 3.9.3)

STN YUL - MONTREAL/DORVAL. QUEBEC	**for use**	**3000**	**6000**	**9000**
FDCN01 CWAO FCST BASED ON 121200 DATA VALID 121800	**17-21**	**0910**	**0906-10**	**9900-15**

13. In the above upper level wind and temperature forecast (FD), what does 9900-15 represent?
    _____. (MET 3.11)

UACN10 CYXU 032133 YZ UA /OV YXU 090010 /TM 2120 /FL080 /TP PA31 /SK
020BKN040 110OVC /TA -12 /WV 030045 /TB MDT BLO 040 /IC LGT RIME
020/040 /RM NIL TURB CYYZ CYHM

14. What is the reported location in the above PIREP? _____. (MET 3.17)
15. If an ATC clearance is not acceptable, what should the pilot-in-command do immediately? _____
    _____. (RAC 1.7)

16. Which of the following classes of airspace requires that a VFR flight establish two-way communication with the appropriate ATC agency prior to entering? Class C, D or E? _____ _____. (RAC 2.8.3, 2.8.4 and 2.8.5)
17. After asking the passengers for their personal weights, what weight should be added for clothing in winter? _____. (RAC 3.5.1)
18. After a flight plan or flight itinerary has been filed but not opened with the appropriate ATS unit, what will happen if the flight is delayed or cancelled? _____ _____, unless it is known that the aircraft has not departed. (RAC 3.6.4)
19. If a pilot closes a flight plan or flight itinerary prior to landing, are the alerting services with respect to search and rescue (SAR) notification still active until after the landing? _____. (RAC 3.12.2)
20. When a mandatory frequency (MF) area exists at an aerodrome but the ground station is not in operation, all reporting procedures specified in CARs 602.97 to 602.103 shall be _____. (RAC 4.5.4)
21. In Canada, the area covered in a visual search during a SAR operation will typically extend to a maximum of _____ on either side of the flight-planned route. (SAR 2.1)
22. Only aircraft equipped with an emergency locator transmitter (ELT) operating on _____ can be detected by COSPAS-SARSAT satellites. (SAR 3.1)
23. Where would you find the index and list of current Canadian aeronautical charts? _____ _____. (MAP 2.2)
24. New or revised VFR operations which are required to be depicted on VFR charts are advertised first by _____ until published in the CFS _____ section then finally updated on the _____. (MAP 2.4)
25. What information would you find in a NOTAM? _____. (MAP 5.1)
26. A pilot renewing a category 4 medical declaration should complete the declaration form _____ days before the expiry date of the medical certificate. (LRA 3.4.1.1)
27. Name one recurrent training program you must have successfully completed within the previous 24 months in order to meet the 2-year requirement. _____. [LRA 3.9, CAR 421.05(2)]
28. An aircraft altimeter which has the current altimeter setting applied to the subscale should not have an error of more than _____ when compared to the known ground elevation. (AIR 1.5.1)
29. If, after receiving routine immunizations, a pilot feels unwell or experiences an adverse reaction, the pilot should wait for _____ and _____ prior to flying. (AIR 3.13)
30. Review AIR 4.13 and AIR Annex 1.0
List what is available in the aircraft that you typically fly that could aid you in the event of an injury or a need for shelter. _____ (AIR 4.13 and AIR Annex 1.0)

Balloon-Specific Questions

31. If the balloon contacts a tree and is moving free of it, what should the pilot do to reduce the risk of adverse consequences? _____. (Use balloon references)
32. A person may conduct a take-off in a balloon within a built-up area of a city or town if the diameter of the launch site is _____. [CAR 602.13 (3)*(d)*]

Glider-Specific Questions

33. The end of the validity period of a medical certificate is calculated from _____ _____. [CAR 404.04(7)]
34. The _____ is the indicated airspeed at which the glider loses altitude most slowly. (Use gyroplane references)

Aeroplane-Specific Questions (including ultralight)

35. If you are approaching for a landing and the wind is gusting from 15 to 25 kt and you normally approach at 65 kt, what should your new approach speed be in those conditions? _____. (Use aeroplane references)
36. Typically, light aircraft are designed to withstand, on landing, 90° crosswinds up to a velocity equal to 20 percent of their stall speed. For an aircraft with a 50-kt stalling speed, what is the maximum permissible 90° crosswind wind speed? _____. (Use aeroplane references)

Helicopter-Specific Questions

37. When landing in snow and using a high-hover technique, the re-circulating snow will obscure the landing site and will rise. In this condition, what should the pilot do? _____ _____ (Use helicopter references or *Aviation Safety Letter* [TP 185] 1/2008)
38. In a dynamic rollover situation, when the rollover starts, a correction should be done smoothly by _____ _____. (Use helicopter references)

Gyroplane-Specific Questions

39. Statistics reveal that the major cause of gyroplane accidents is pilot error and it is often linked to the lack of _____ _____. (Use gyroplane references)
40. To minimize the possibility of pilot-induced oscillation (PIO), avoid [high/low] speed flight in gusty conditions, and make only [large/small] control inputs. After making a control input, wait briefly and observe the reaction of the aircraft before making another input. (Use gyroplane references)

Answers to this quiz are found on page 16 of ASL 4/2010.